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The Government and the Railways

LAST week we set out the regulation under the Emergency Powers (Defence) Act, 1939, which has enabled the Ministry of Transport to take control of railway undertakings in Great Britain. We also referred to Section 16 of the Regulation of the Forces Act, 1871, in pursuance of which control of the railways in Great Britain was taken over by an Order in Council on August 4, 1914. Apart from the differences in the method of granting the powers there are interesting variations in the procedure adopted for control in the two war periods. In 1914 the railways were not taken over until after war had been declared, whereas on this occasion the control has been exercised as from September 1, before the beginning of hostilities. Again in 1914 the control was more limited, as it was confined to the railways now belonging to the four main-line companies together with certain smaller railway undertakings outside London which have retained a separate existence, and to the Metropolitan and the District Railways. The London tube railways were not then included in the scheme. The control now exercised embraces the four main-line companies; the London Passenger Transport Board; any joint committee of any two or more of the four companies and London Transport; the East Kent Light Railway Company; the Kent & East Sussex Light Railway Company; the King's Lynn Docks & Railway Company; the Mersey Railway Company; and the Shropshire & Montgomeryshire Light Railway Company. A significant difference in the two methods is that the present control includes the whole of the London Transport undertaking, namely, tramways, trolleybuses, buses, and coaches, as well as all its railways, whereas in 1914 there was no such control of tubes and road transport. A Railway Executive Committee does the practical work now as it did in 1914.

* * * *

Australian Emergency Preparations

An indication of how widespread have been precautionary measures in case of war is given by steps taken in Australia. To ensure adequate protection for vital transport services, the Commissioners for the administration of the Victorian Government Railways set up a departmental committee, consisting of Mr. N. C. Harris (Commissioner) and the heads of the principal departments. The committee's work consisted in the preparation of a special code for train operations under emergency conditions, alternative methods of handling traffic in the event of local disorganisation, and protection of structures and personnel. Classes have been organised to train men in anti-gas measures and a sub-committee has been studying the question of lighting restrictions. In this connection a valuable contribution to the efforts of the committee has been made by Mr. E. O. Olsson, of the Electricity Branch, in the shape of a light dimming device, which effectively solves the problem of dimming outside lights, particularly on the platforms of railway stations. According to the description, it prevents the emission of direct rays from the filament, screens any brightly-lit reflecting surfaces, and by the use of multiple reflection emits an evenly diffused cone of light.

* * * *

Overseas Railway Traffics

Most of the Argentine railway companies have recovered during the first nine weeks of the current financial year some of the traffic losses they sustained in the corresponding period of 1938-39 in comparison with 1937-38. At this time a year ago the Central Argentine was £327,444 down in the aggregate compared with 1937-38, but it has now recovered £196,041 of this loss. On the Entre Rios the present aggregate gain of £10,590 for the nine weeks follows one of £10,242 a year ago. The Central Uruguay for the eight weeks of this financial year is £4,803 down in sterling but $69,054 up in Uruguayan currency.

	No. of Week	Weekly Traffics	Inc. or Decrease	Aggregate Traffic	Inc. or Decrease
		£	£	£	£
Buenos Ayres & Pacific	9th	75,310	+ 4,280	623,760	+ 14,577
Buenos Ayres Great Southern	9th	118,548	— 5,894	966,315	— 73,078
Buenos Ayres Western	9th	39,702	+ 3,474	340,819	+ 27,235
Central Argentine	9th	122,881	+ 16,336	1,064,026	+ 196,041
Canadian Pacific	33rd	527,200	+ 3,800	16,268,000	+ 266,400
Bombay, Baroda & Central India	20th	186,525	+ 4,200	3,297,975	— 60,900

Aggregate gross earnings of the Canadian Pacific Railway for the first seven months of 1939 were £14,693,000, an increase of £217,400 in comparison with the first seven months of 1938. Aggregate net earnings for the same period amounted to £1,195,400, an increase of £557,800.

* * * *

Sixteen Weeks' Freight Traffics

With the Ministry of Transport statistics for the month of March, 1939, are published the aggregate figures of freight traffics for all standard-gauge railways in Great Britain for the sixteen weeks ended April 22, 1939. Separate figures are also given for each of the last two four-weekly periods included in those sixteen weeks, and they show in those two periods a substantial improvement on the position revealed in the eight weeks ended February 25, 1939. In comparison with the corresponding period of 1938, the higher class merchandise of 7,649,050 tons carried in the eight weeks ended April 22, 1939, showed an increase of 37,876 tons or 0·50 per cent., with receipts of £6,522,249, which were higher by £8,302 or 0·13 per

cent. In the previous eight weeks the tonnage had fallen by 6·27 per cent. and the receipts by 3·35 per cent. Classes 1 to 6 provided 7,419,375 tons, a drop of 1,309,540 tons or 15 per cent., and the £2,020,348 receipts therefrom were lower by £320,730 or 13·70 per cent. Tonnage in these classes for the previous eight weeks had dropped by 27·36 per cent. and the corresponding receipts by 25·03 per cent. Of coal class traffic 28,168,575 tons were carried, an improvement of 228,633 tons or 0·82 per cent., producing receipts of £5,608,471, which were higher by £43,834 or 0·79 per cent. In the eight weeks ended February 25 last the tonnage had fallen by 2·57 per cent. and receipts by 0·19 per cent.

* * * *

Transport History of Gloucester

The old city of Gloucester grew up, like London, at a point where a great river could be forded and at the head of navigation for ocean-going ships. Though the Severn is too shallow for present-day vessels of the larger sizes, ships laden with timber from the Baltic are able to reach Gloucester by way of a canal parallel to the main river. Gloucester is, moreover—and has been for a century—an important railway centre. It is, as the L.M.S.R. journal, *On Time*, says, "a great clearing-house of traffic to and from the West." The Bristol & Gloucester Railway was formed when a horse-worked tramway from Bristol to near Westerleigh—opened in 1835—gained powers to make an extension to the cathedral city, an extension which was to form part of a most important link in the chain of steel which now joins Derby and Birmingham with Bristol. Gloucester is an important industrial and agricultural centre, and much freight traffic passes to and from the L.M.S.R. and the G.W.R. An interesting fact is that loaded coal trains may be seen passing through Gloucester in opposite directions—north-bound trains with coal from South Wales and the Forest of Dean pass trains going southward with coal from the Midlands intended for Bristol and the South-West.

* * * *

A.T.C. Between Edinburgh and Glasgow

After the serious accident at Castlecary, L.N.E.R., on December 10, 1937, that railway decided to instal A.T.C. equipment on its Edinburgh—Glasgow main line and selected the Hudd magnetic inductive system, which was already in use on the L.M.S.R. London—Shoeburyness line and was described in our issue of August 12, 1938, page 295. On page 348 in this issue we reproduce an article from the *L.N.E.R. Magazine* by Mr. E. D. Trask describing the Edinburgh—Glasgow installation. It will be remembered that at Castlecary the indication of a distant signal was disputed, two drivers asserting it was "off" and a signalman that it was "on." Unfortunately the signal had been neither "proved" nor repeated and whether it was "on" or not was never established. A.T.C. apparatus would have warned both drivers, for the signal lever was certainly normal, and in his report on the disaster, published in June, 1938, Colonel Mount recommended the L.N.E.R. to take steps to introduce such equipment on a main-line section. The route on which the accident happened was in due course selected for it, and part of the installation is now in service.

* * * *

What Railroads Should Know About Scrap

Finished iron and steel purchased by the railways in the U.S.A. is now so largely made from iron and steel scrap, and the railways themselves furnish so large a proportion of the total scrap produced in the country, and derive so much income annually from its sale (approximately 70 million dollars in 1937) that our American contemporary, the *Railway Age*, has published under the above heading some interesting information, prepared by the United States Institute of Scrap Iron and Steel, on the subject. Ninety per cent. of all the steel produced in the U.S.A. is open-hearth, and scrap comprises approximately half of the raw material charged into the furnace, the proportion being determined by the extent of the reserves of iron ore and coal. In 1937, 38,006,272 gross tons of scrap were used in the U.S.A., with 34,056,527 tons of pig iron. Many railways have elaborate systems of reclamation, and one large Eastern line averages over 10,000 tons of scrap a month, whereby it picks up about $2,000,000 in a good year. The American Iron and Steel Institute has estimated that the amount of iron and steel currently in use in the United States in all forms, is 1,050 million tons. Subject to the toll taken by corrosion, the average life of all steel is estimated at 33 years. The supply of scrap is thus self perpetuating.

* * * *

High Speed Earnings

Further striking evidence that high speed is a paying proposition is afforded by some figures recently made public concerning the Hiawatha—the streamlined steam-hauled express of the Chicago, Milwaukee, St. Paul & Pacific RR., which, as described in our issue of June 9, page 937, runs on a 6½-hr. schedule between Chicago, St. Paul and Minneapolis, 411 miles. Despite the competition of the diesel-operated Zephyrs of the Burlington route and the "400" of the Chicago & North Western, which also maintain a 6½-hr. service between Chicago and the Twin Cities, the Hiawatha is calculated to earn up to $4·34 gross per train mile. Since its inauguration in 1935, the total net earnings of this express have been $2,929,435, which is more than three times the cost of the eighteen cars and two Atlantic locomotives required for the maintenance of the original service—since doubled—once in each direction daily. Thus the Hiawatha net earnings per train mile in four years work out at $2·44, or, at the present rate of exchange, at 10s. 5d., a profit slightly less than that of the L.N.E.R. Silver Jubilee between London and Newcastle, which was put into operation in the same year, and is reckoned to have earned 12s. 6d. per train mile. In the latter case it was calculated that in three years the supplementary fares levied for the use of the service would pay the cost of building the original seven-car train. These profits do not include the heavy expenditure needed to adapt both track and signalling to the higher speeds of the streamline services; such improvements certainly benefit operation as a whole, although they are carried out primarily in the interests of high speed.

* * * *

Transverse Fissures in Rails

In North America the problem of the transverse fissure in rails continues to occupy much attention. Although the cure of retarded cooling is now being applied on an extensive scale, the fact that fifteen years passed between the first appearance of this dangerous defect and the application of any serious measures of protection against it inevitably means that many years must still elapse before it will be possible to relax the present vigilance in fissure detection or reduce the heavy expense of replacing fissured rails. An article on p. 360 of this issue gives some new information on the subject, in particular the interesting fact that rails rolled from the middle of ingots are more susceptible to shatter-cracking than top or bottom rails. The research described in the article failed, however, as other such research has failed, to relate the actual

production of shatter-cracks to any stage of rail manufacture other than the cooling out of the rails after rolling, in the range of temperature from 300 deg. Cent. downwards. The article describes also the method of retarded cooling largely used in Canada and the United States, namely, by loading the hot rails into large tanks, in which they are covered up and allowed to remain from 24 to 30 hr. The Sandberg method of retarded cooling in an oven has the advantage of taking only a small fraction of the time for cooling the rails out that is required by this tank cooling, though the latter requires less expensive equipment, which need not necessarily form a part of the rail cooling-bank. But the tanks must be readily accessible by cranes from the rail-bank for the transfer of the rails.

* * * *

Does Water Softening Pay?

Before it can be established that softening plants for the treatment of boiler feed water will pay, there must be taken into account such factors as the first cost, annual cost of maintenance, operation, and other recurring items of expenditure. One of those who participated in the discussion on a paper entitled " Treatment of Locomotive Feed Water," read before the Indian and Eastern Centre of the Institution of Locomotive Engineers, pointed out that to equate against this, figures must be produced showing the annual savings obtained by reduced boiler maintenance and fuel consumption, and increased engine availability. Another speaker said that the necessity for feedwater treatment had been increasingly felt in India since the adoption of multiple engine crews and more intensive usage of locomotives. The greatest single factor which tended to hinder more intensive use of engines in sections where water conditions were poor was the necessity for frequent boiler washouts, each meaning the loss of 20 to 24 hours of engine availability, so that in one month 8 to 10 days could be lost on that account. Such figures are of course largely in excess of those usual in this country. The engines covered from 5,000 to 8,000 miles monthly under existing conditions, but if washouts could be fixed at, say, one a month, which would be possible if feedwater were treated, these engines could easily cover over 10,000 miles a month.

* * * *

Season Sickness

A correspondent has sent us a cutting from the *Halifax Guardian* of March 15, 1862, in which were reproduced some conclusions of the *Lancet* regarding a series of papers on the injurious effects of travel by rail. Particular apprehension was expressed for the health of season ticket holders, whose physique was considered particularly vulnerable because already undermined by years of " hard and exhausting employment of mind and body." It was concluded that " few men can endure without suffering to travel 50 or 100 miles daily to their business for any length of time," and the case was quoted of a banker so exhausted by such a performance—although he did it only three or four times a week—that he had to lie down half an hour before he could sign a cheque. Some support might still be found here and there for the contention that the design of the carriages did little to mitigate the physical discomforts of rail travel, but there would be less sympathy for a suggestion to obviate the exhausting effects of running to catch a train. Last-minute dashes, and sitting down " heated and breathless in the draught caused by the moving train " were to be countered by " closing the doors at termini five minutes before the departure of each train."

War—and the Outcome

WAR, which had seemed—especially to those with experience of the 1914-18 conflict—too horrible to contemplate again, is upon us. The hateful fact must be faced, and every effort must be strained to achieve the end on which we are set. With the incalculable development of applied science since the last war none can foretell what destruction may now take place. In the meantime, although business as usual is of course as impossible as it was clearly shown to be in the last war, efforts are being made to carry on the work of the nation with as little deterioration as possible. Even before the declaration of war the railways had been engaged since Friday, September 1, in the task of evacuating from London and other of the more vulnerable centres of population, children and special cases to billets in the country. This task, which was carried out without a hitch and involved the movement of upwards of 3,000,000 persons by special train, naturally necessitated a certain amount of restriction on ordinary travel; but it was a matter of surprise to the general public who had to make journeys that the interference with their comfort and convenience was so small. Suburban services taking business people to and from their places of work morning and evening were scarcely affected. Two days before the declaration of a state of war between this country and Germany, the Ministry of Transport announced the taking over of the railways and their administration on its behalf by the Railway Executive Committee, under the chairmanship of Sir Ralph Wedgwood. Normal railway services are being maintained although, as was to be expected, such luxuries of peace time as the high-speed expresses are being withdrawn.

The general feeling of peoples in every country is that although we have to go through with this war, it must indeed be the last, and it must be finished as quickly as may be, but none the less thoroughly. There seems to be less disposition to concentrate on allocating the blame than there is for seeking a means whereby the evil things that have precipitated war shall in future have no soil in which to thrive. The peace which lasted from 1919 to 1939 was not accompanied by the prosperity or the happiness that the advance of science would have amply justified. It was accompanied instead by a sense of insecurity, national and individual, by wrongs, national and individual, that could have been righted, by poverty and the restriction and even the destruction of the very things that could have ended poverty and made freedom a reality for the individual. These things must never be tolerated again. There is an urgent, if so far unformulated, desire for a positive outcome of this war which shall make impossible for the future dictatorships of any kind, and shall assure the true democracy which enables the good will of all normal individuals to be translated into practical government.

* * * *

The Economics of Acceleration

FIRST among the impressions to be derived from a study of the methods used by railways on the mainland of Europe during the past five years to speed up their passenger services is the amount of preparation and of cost that have been necessary in making their purposes effective. The admirable reports on this subject to the International Railway Congress Association, reviewed on p. 000 of this issue, reveal, for example, that the German State Railway has spent 33,000,000 RM. in adapting 13,670 miles of track for speeds up to 75 m.p.h., 24,000,000 in laying in fast-running junctions, and a further 11,000,000 RM. on the improvement of station layouts. To such perfection has track design attained that in

both Germany and France canted junctions are laid safely permitting speeds up to 75 m.p.h. over the diverging track. Further considerable sums have been spent in the adaptation of signalling to the higher speeds, and on improvements in braking systems to give better control. Remarkable progress has been made in rolling stock design, whereby the German State Railway, for one, has succeeded in reducing coach tare weights by no less than 58 per cent., without sacrifice of strength, comfort, or accommodation. No less remarkable has been the advance made in steam locomotive design, so that locomotives of the late Paris-Orleans Railway of France, reconditioned at a cost equal to one-half that of building new locomotives, have shown a continuous drawbar horsepower at 68 m.p.h. that is 83 per cent. more than that exerted by the same engines before conversion, and a reduction of over 50 per cent. in coal consumed for any given output at high speed.

The second impression is that, notwithstanding all the improvements that have been brought about in the technique of locomotive design, European countries in general do not intend in future to place reliance on steam for their ultra high speed work. The *rapporteur* for France and Italy gives electrification of all important main lines as the ideal to be pursued, most attractive, of course, to those countries in which there are abundant sources of water power, and which either have no indigenous coal, or have coal which has to be transported considerable distances before use. Italy aims at higher speeds on its electrified lines, with railcars or high-speed electric train units scheduled to average 75 to 81 m.p.h. on main lines, and maximum permissible speeds up to 100 m.p.h., while railcar travel on secondary lines is to average up to 62 m.p.h.; for this purpose many further railcars and " electrotrains " are to be introduced, whereas there is to be no further building of steam locomotives. So far as concerns international and other trains on main lines, composed of ordinary stock, the intention in Italy is to build more powerful electric locomotives capable of hauling heavy loads at 75 m.p.h. In France and other countries not so completely electrified as Italy, the future *rôle* of the steam locomotive appears to be that of the maid-of-all-work, hauling long-distance trains which incorporate many through sleeping cars or through ordinary coaches in their formations. Nevertheless it is significant that in France, where many high-speed services had been established with railcar units propelled by internal combustion engines, in recent depressed conditions these have been regarded as " supplementary " or luxury facilities rather than an essential part of present-day train services, and have therefore been the first trains to be withdrawn, leaving the steam locomotive to maintain most of the fastest express passenger services over nonelectrified routes.

It is in Germany, however, that the most definite and permanent relation has been laid down between diesel, electric, and steam propulsion. Electrical working is reserved for routes conveying heavy traffic which are wholly or in part through mountainous districts. In every direction through Germany diesel railcar units are established as the ultra high speed mode of travel, but on services of more or less fixed seating requirements; Germany authorises a maximum speed of 100 m.p.h. with these units, which is maintained over long distances where conditions are suitable and, in numerous cases, permits start-to-stop schedules averaging from 75 to as much as 83 m.p.h. It is stated that there is no present intention of raising this speed limit, but it is intended to increase the number of these ultra high speed services as conditions permit. Long distance services which are more heavily patronised, and in particular, those on which it is necessary to convey through coaches, will continue to be worked by steam, so that there is every justification at the same time for increasing the capacity for sustained high speed of the steam locomotives in order to meet acceleration demands. In other countries on the mainland of Europe —excepting those which, like Switzerland and Sweden, have developed electric traction on an extensive scale—the leaning is generally towards diesel railcars or diesel train units for high-speed work, and apart from the economy of diesel working as compared with steam, one reason for the preference, no doubt, is that owing to the relatively low centre of gravity and light axle weight of the diesel units, less is needed in the way of track preparation than would be required for heavy steam locomotives travelling at high speeds. Norway, Roumania, Jugoslavia, and Bulgaria, are all countries intending to accelerate their passenger services by means of diesel railcars.

The third impression derived from these reports is that although not every European country is satisfied that ultra high speed travel is economically justifiable—France, for example, is one present exception—all the countries that have accelerated their services are in agreement that this has been done more economically with diesel and similar railcars than would have been possible with steam. Detailed figures are given in the reports to prove this point. From the earliest single railcars there have now developed complete diesel-propelled units of three and four cars, and if, as in Germany and Holland, two or more units can be coupled and worked multiple-unit fashion where traffic demands require it, the objections to the inflexibility of diesel railcars in meeting variations in traffic demand are overcome, though diesel propulsion still does not approach the capacity of the steam locomotive in adapting itself readily to wide variations of load and speed demand. Agreement is reached in the report that the life of a railcar may be put at a minimum of 20 years—the German State Railway estimates it at 25 years—and that an average distance between heavy repairs of from 140,000 km. (87,000 miles) to 200,000 km. (124,250 miles) should be aimed at, which works out at a daily average of 400 km. (250 miles) for each railcar of any given group. Of each group it may be anticipated that from 20 per cent. to (in the case of high-speed cars) 30 per cent. will be together under repair at any given time. Most impressive of all the figures in these reports are those given by the Reichsbahn authorities of the economies that they consider have been effected in Germany as the result of wholesale acceleration of services. While faster running entails greater expenses in locomotive fuel and lubricants, and in both rolling stock and track maintenance, the operating costs—enginemen, guards, ticket collectors, cleaning and maintenance of vehicles, as well as costs of renewal and interest on the capital so represented—are spread over a greater mileage, and elaborate graphical calculations prove that the latter saving more than offsets the former increase of expenditure. As a result, it is calculated that if the 1938 train services in Germany were reduced to the speed of those operating in 1932, there would have been an expenditure greater by 27,000,000 RM. in 1938 than in 1932. This saving is a handsome return in interest on the total of 106,000,000 RM. spent by the German State Railway administration in preparing for acceleration, and apart entirely from the additional traffic attracted by the fast travel, it proves up to the hilt the axiom that high speed pays.

NEW BELGIAN LOCOMOTIVES.—The streamlined Atlantic locomotives built to operate the fast Brussels—Ostend trains, with a Brussels—Bruges booking of 74·7 m.p.h., on the Belgian National Railways, after having been run-in on the light and not very rapid trains connecting with the evening Ostend—Dover boats, have since been giving full satisfaction on their high-speed duties.

PUBLICATIONS RECEIVED

Eighty-eight Not Out. By Harold Hartley. London, 1939: Frederick Muller Limited, 29, Great James Street, W.C.1. 8¾ in. × 5½ in. × 1½ in. Illustrated. Price 12s. 6d. net.—In the modern world, where no event of importance occurs but its very atmosphere and setting are made familiar to the multitude by the radio and cinema—it seems almost that we have lost the faculty of wonder. If a young writer today were asked to recall his first visit to "the pictures," it is doubtful whether he could sincerely evoke such feelings of admiration and awe as the young Victorian felt when introduced to the delights of the panorama. After the painted backcloth and the lecturer's suave discourse, it was not unnatural to seek something nearer reality. This, then was the age of great exhibitions, when brains sharpened by the zest for novelty scoured the world and the resources of invention to call forth the exclamations of "stupendous," "magnificent," and "breath-taking" which have since degenerated into the *patois* of film-producers.

This book of reminiscences by Mr. Harold Hartley is described in a subtitle as "A Record of Happy Memories," and its author has been intimately associated with the great exhibitions at Olympia and Earl's Court, the preparations for which involved him in much travel and many meetings with famous personalities. At the age of 88, he has achieved the remarkable feat of writing a full account of his crowded life entirely without the aid of notes. He was encouraged to undertake the task by Viscount Covedale (Oliver Baldwin), who has known the author for a number of years and who contributes a preface. Lest it be thought that to associate with exhibitions is to be merely a spell-binder, let us explain at once that Mr. Hartley can produce the testimonial of a famous and learned son—none other than Sir Harold Hartley, Vice-President of the L.M.S.R. for Works and Ancillary Undertakings and Director of Scientific Research. Mr. Harold Hartley owed his introduction to the exhibition world through receiving a contract from Sir Joseph Lyons to supply aerated water for the refreshment of workmen engaged on the completion of the Imperial Institute—Lyons & Co. being responsible for catering for the workpeople. With Sir Joseph Lyons and his partners, he was successful in gaining permission to erect stands and decorate the streets for the opening of the institute by Queen Victoria, although this first venture in catering for public love of the spectacular was somewhat impaired as a paying proposition by the fact that free seats in the stands had to be sent to members of both Houses of Parliament, all members of the Corporation, every provincial mayor, and all the royal guests.

Lyons & Co. was at this time responsible for running the bars at Olympia, and the idea occurred to Sir Joseph of staging a reproduction of Venice in the great building. Mr. Hartley collaborated in the arrangements for the "Venice in London" exhibition of 1891, and so was fairly launched upon the road to Earl's Court and its historic associations. For after his Olympia experience Mr. Hartley became Managing Director of the Exhibition Company which took over the lease of the Earl's Court grounds from the railway companies concerned. Here the Empire of India exhibition was opened, and with it the Great Wheel became a London landmark and a British byword, of which parents years later related memories to children born into an age of aeroplanes. Everyone knows the story of how the Great Wheel stuck and trapped its passengers aloft overnight, but Mr. Hartley can tell how he took a party of royal visitors for the first ride ever made in the wheel, which had not been opened to the public—and what his astonished colleagues said when they saw the wheel revolving with its distinguished freight.

We are old enough to remember the series of exhibitions at Earl's Court, London, but until reading this book we had never realised how much preliminary work and travel was involved in their preparation. Mr. Hartley made it his business to visit all foreign exhibitions, and it was while on these extensive tours in 1895 that he saw a mimic "naval battle" presented on a lake in Berlin. As a spectacle it was a failure, but Mr. Hartley saw its possibilities. His enthusiasm increased when he encountered the same show in Budapest in 1896, and later in Brussels, and at length he came to terms with the proprietor for a fleet of boats and trained operator. From this spectacle, which when he first saw it struck Mr. Hartley as "a dreary failure," there was developed the great naval spectacle at the Earl's Court Universal Exhibition of 1898, which Mr. Hartley describes as "a novelty calculated to make the heart of the Jingo leap for joy and even to make a Little Englander hum his 'Rule Britannia,'" Elsewhere in the book we find Mr. Hartley in Venice acquiring gondolas and gondoliers for "Venice in London"; in St. Petersburg, where unsuccessful negotiations were pursued for a Russian exhibition in London; and travelling in the Balkans, where Mr. Hartley was received by King Peter in Belgrade, and by King Carol and the Crown Prince and Princess of Roumania. Mr. Hartley's descriptions of the scenes he witnessed on his travels have a graphic quality in which can be discerned the penetrating observation which enabled him to re-create at home for the enjoyment and instruction of thousands the episodes of which—somewhat in the rôle of an unofficial ambassador—he was a privileged spectator.

The Earl's Court exhibitions were suspended after the Hungarian Exhibition of 1909, the directors having come to the conclusion that "it was obvious . . . that we were unable to compete with any chance of success with the White City. We decided to pay off our debentures and hand over the company's assets to the creditors." Many with memories of Earl's Court will regret the decision, feeling that had it been possible to tide over the difficult times Earl's Court, the Great Wheel, and their associated attractions might have continued household words not only to Victorians and Edwardians but to Georgians and perhaps even until the wheel comes full circle and a queen again sits on the throne of England.

There is far too much of interest and colour in these pages to be epitomised in a brief review, and we can but refer to the concluding pages in which the author writes of his hobbies, his journalistic memories—he was one of the founders of the *Burlington Magazine*—and his son's career. Of his son at the age of five, Mr. Hartley says: "Even at that early age we were conscious that he was exceptionally gifted, and, given the opportunity, might play a big part in the world—a prediction I may claim to have been realised, very largely due to the efforts of my second wife, who took the greatest interest in his education and stimulated his ambition." Sir Harold Hartley was educated at Dulwich College and was awarded a Brakenbury scholarship at Balliol, where in 1900 he took a "first" in chemistry and mineralogy. He also studied the latter subject at Munich, and later went to Heidelberg. In 1914 he was given a captaincy in the 7th Battalion of the Leicestershire Regiment, and in 1915, after the Germans had used gas, was made Chemical Adviser to the Third Army. In 1917 he was made Assistant Director of Gas Services at G.H.Q., and just before the Armistice he came home as Controller of the Chemical Warfare Department of the Ministry of Munitions. After the war, Sir Harold Hartley became a Director of the Gas Light & Coke Company in 1922, and later a member of the Fuel Research Board. He accepted Sir Josiah (now Lord) Stamp's invitation to join the L.M.S.R. as a Vice-President and Director of Research in 1930.

It is interesting to speculate how much traffic was brought to the railways by Mr. Hartley's activities, both directly in the shape of visitors to these exhibitions, and indirectly in the thousands who must have been inspired to travel by the larger world eh showed.

The Nile Voyage.—We have received from Thos. Cook & Son Limited the 1939-40 edition of the Nile voyage booklet. The routes are from Asswan to Cairo, and from Asswan to Wadi Halfa, and the voyage is made in Cook's luxury steamers, cabin plans of which are reproduced in the booklet. The schedule of sailings in the 1939-40 booklet extends from early December this year until next March.

THE SCRAP HEAP

EARLY SPANISH TRAM AND BUS TICKETS

The recent developments in Spain have stimulated interest in all Iberian subjects, not the least in folk customs and manners. Some of these customs are depicted on such prosaic bits of paper as early tram and omnibus tickets. As elsewhere on the Continent, tramways appeared in the late 'sixties and both means of transport catered for patrons by the oddest means. The difficulty lay in getting the public to board the cars; the distances travelled were short, the trips expensive, and the vehicles slow and uncomfortable. The companies, therefore, used other means to attract the public—and threw in the tram journey as an extra.

Nowadays a ticket is essentially utilitarian, but the early Spanish tickets were illustrated, and sets of them appeared, which the public tried to collect. The holder of a complete series could exchange it at the companies' offices for a prize, such as a free pass. This curious custom was kept up for some years, but the old tickets, which were always scarce, are now as extinct as the dodo; no sets besides those in Mr. Weiner's collection appear to exist.

The first sets were roughly drawn and badly produced on cheap paper, but as the public sought them the tickets were more elaborately printed, and finally both Madrid and Barcelona came up with many coloured lithographs depicting all kinds of subjects. There were caricatures and humorous drawings with anecdotes on the reverse, scenes from bullfights, characters in plays, and the life and doings of Don Quixote and Sancho Panza. Famous people, kings, and—to descend from the sublime to the ridiculous—the popular characters of the *Commedia del' Arte*, such as Punchinello, and Harlequin and Columbine, were likewise represented. Yet again, there were sets illustrating Spanish provincial costumes and the lighter side of theatre dressing-room happenings.

* * *

KING EDWARD STATION

Mr. A. J. Esslemont, the Station-master at King Edward station, Aberdeenshire, L.N.E.R., is frequently asked by members of the travelling public how the place derived its name, and his researches, prompted by such enquiries, form the subject of a short article in the *L.N.E.R. Magazine*. The earliest indication of the name is obtainable from records of the church, the first known reference to which is contained in a Charter dated between the years 1178 and 1199 in which a certain "Henry, parson of Kynedor," appears as a witness. Later a very valuable and interesting link is furnished by a document in the custody of the minister, in which is incorporated a Charter of June 24, 1406, that mentions the name of "Kynedward." In connection with ancient gifts of land to the church, mention is made of another Charter, beautifully written and dated September 17, 1626, wherein the present-day name of King Edward is mentioned.

In the Banffshire Field Club booklet (Milne), entitled "King Edward Castle," dated 1886, the name of "Keineder" appears in the year 1273. In the same publication it is mentioned that in 1547 Queen Mary (Queen of Scots) gave "to William, Master of Forbes, son and heir apparent of the builder of the Castle" various lands including "the Mill of Kinardword, the fortalice of Kinardword with the gardens and greens and other things thereto belonging." The parish is known colloquially by the homely appellations of "Kinedart" and "Kinedar." Mr. Esslemont points out the phonetic similarity of the various forms of the name and suggests that "Kynedor" is a Celtic name derived probably from "Ceann," a head and "dor," water, a height or promontory on the water, which accurately describes the situation of the now-ruined King Edward Castle.

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EDITORIAL IDIOSYNCRASIES

Under the title "Our Editorial Idiosyncrasies," our contemporary *The Commercial Motor* published a leader on August 18, of which the following are extracts:—

"Brilliantly, Mr. A. P. Herbert recently translated Nelson's famous message into what an unkind friend described as *The Commercial Motor* style. During the holiday period, sometimes named the silly season, although chained to our desk, we can smile at ourselves, and here, it seems, is an opportunity.

"Primarily we aim, in our style, at lucidity and conciseness, attempting always to write correct English and to preserve a dignity befitting our subject. We have been called pedantic, and if there be justification for this accusation it is probably because rules, made originally to check the abuse of words or phrases or to eradicate loose habits of writing that are too easily acquired, have been slavishly observed.

"For example, the word 'very' is freely over-employed, largely through laziness in not troubling to think of a more closely defining adverb. 'And also' is a parallel instance. Nearly always it is redundant to employ both words; only when one is used as a conjunction and the other in an adverbial sense are they together permissible. Such obvious redundancies as hollow tube, round disc, foot pedal never appear on our pages.

"Collective nouns—public, crowd, etc.—we correctly treat as entities and therefore singular, and this might suggest pedantry, because the reverse practice is growing. A company is a unity.

"In V-type, H-girder and S-bend we prefer the letter to the sound, because the shape is the point—Ess-bend is not nearly so graphic.

"Let those mock who will. Our course is the harder, but we will stick to it so long as we feel that it is right."

[All honour to our contemporary for its stand. On some grammatical points our own interpretation differs from that of *The Commercial Motor*, but we of THE RAILWAY GAZETTE regard the misuse of language as the abuse of a valuable tool, and therefore unworthy of a journal dealing with a branch of engineering. Being human we err, but we do not attempt to justify our slips by terming them "common usage." How superior our contemporary must feel when it receives from a great railway company (as not infrequently we do), an official statement beginning: "The Capital & Counties Railway Company *have* decided to repaint certain of *its* stations."!—ED. *R.G.*]

King Edward station, between Inveramsay and Macduff in Aberdeenshire, L.N.E.R., formerly on the Great North of Scotland Railway

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

ARGENTINA

New State Railway Constructions

A contract for the construction of a branch line of the State Railways, 50 km. long, from Paraná to Maria Grande in the Province of Entre Rios, has been awarded by the Argentine Government to the firm of Hume Bros., Limited. The total cost, originally estimated at $3,500,000 paper, has now been fixed at $6,100,000. Three years are allowed for the completion of the work.

The same firm has also been awarded the contract for the construction of the line from La Paz to Feliciano and San Jaime, at a cost of $2,500,000. The contract stipulates that the work must be completed by March 31, 1940.

"Go-slow" Movement on B.A.P.R.

The Argentine railway world has again been disturbed by labour agitation, the B.A.P.R. having suffered for over a week from a "go-slow" movement organised by the outdoor staff as a protest against the wage-cuts which the company announced would be reimposed as from July 1, in view of the unfavourable financial position. Of the movement itself there is not very much to record. No overt acts of sabotage were reported; the men displaying an attitude of passive resistance consisting in a rigid adherence to the obsolete working regulations dating half a century back, which are still retained in the rules book, and for the abolition of which the companies are continually pressing. Stoppages of a quarter of an hour's duration or longer, at intervals during the day, completely disorganised the traffic and upset the timetable, nearly half the trains having to be cancelled, while those which it was found possible to run were much delayed, to the serious inconvenience of the passengers, some of whom, in one instance, vented their exasperation by breaking the windows in the coaches and slashing the seats.

The Union Ferroviaria and La Fraternidad stood aloof from the movement, which was organised by a newly-formed body known as the Federación ed Empleados y Obreros Ferroviarios, composed of members of the two first-mentioned unions who had broken away from these organisations on the grounds that they were too conciliatory in their attitude towards the companies. It was estimated that some 3,000 men were affected by the movement, which extended throughout the system as far as Mendoza, and also involved the workshops at Villa Palmira, where the employees to the number of about 500 suspended work for a quarter of an hour, for which action they were sent home.

The railway authorities refrained, for the time being, from taking disciplinary measures against the strikers, and merely issued a statement to the heads of the federation, giving figures showing that the financial position of the company amply justified the application of the wage reductions, amounting to 10 per cent., to be returned when circumstances permitted, in accordance with the terms of the Presidential Award on the subject. Delegates of the federation had interviews with both the President of the Republic and the Minister of Public Works, when the men's representatives stated their case, and expressed their determination to maintain the movement until their demands were granted.

Finally, the Government ordered the railway company to take steps to restore its services to normal within 12 hr., failing which all employees who refused to co-operate were to be dismissed and their names brought to the notice of the Government for the infliction of the penalties provided in such cases. As this ultimatum was, however, ignored by the federation, the Minister of Public Works formally notified the Minister of Justice and Public Instruction of the defiant attitude maintained by the union. This was interpreted as the preliminary step towards the withdrawal of the legal status of the union, and the following day it was announced that the leaders had called off the movement, with the result that the railway services were restored to normal conditions. It was obvious that on this occasion the authorities were determined to put a stop to the acts of indiscipline on the part of the men affiliated to the new society.

The Position on Other Railways

On the first day, the staff of the Compañia General de Ferrocarriles de la Provincia de Buenos Aires joined in the movement; but as the result of a meeting between the representatives of that railway and the men's delegates, it was arranged that the company would return 30 per cent. of the money already discounted, and the remainder at a later date. To this the men agreed, and work on this line thereafter became normal. A few days later the movement extended to the Central of Buenos Ayres Railway, the employees of which suspended work for 15 min. as a protest against the wage-cuts on that line. The B.A.G.S., B.A.W., and Central Argentine Railways were, however, entirely unaffected, and traffic working on all these lines proceeded without interruption.

Possible Cancellation of the Award

A memorandum has now been addressed by the Director-General of Railways to all the companies and the unions, asking for their views in regard to the convenience or otherwise of cancelling or modifying the wages agreement between the companies and the men, made in 1931, and the Presidential Award of 1934. In the event of it being thought desirable to cancel the agreement and the Award, alternative proposals must be submitted to the Government by both parties to the dispute before July 31. Following a petition addressed to President Justo by the unions in 1937, asking for the cancellation of the wage cuts on the grounds that the necessity for these no longer existed, all the companies submitted a joint memorandum to the Government, in which they expressed the opinion that it would be contrary to the public interest to denounce the Award, at that time. The question was then submitted to the Attorney-General, who decided that the denunciation of the Award by either of the parties did not oblige the Government to make any declaration in regard to its validity, but neither did it prevent future amendments being made to it, after taking due consideration of the financial position of the railways.

FRANCE

Increase in French National Railways Traffic

Receipts of the French National Railways Company in the first half of 1939 show an increase in comparison with the same period of 1938 of 11·31 per cent. per kilometre. The actual receipts from January 1 to July 2 were as follow :—

	Jan. 1 to July 2 Fr.	Increase Fr.
Passengers...	1,929,305,000	300,122,000
Luggage ...	35,128,000	6,408,000
Parcels ...	278,285,000	2,091,000
Goods ...	5,486,536,000	476,862,000
Total receipts	7,729,254,000	785,483,000

Railway Equipment and Electrification

By a Decree, dated November 12, 1938, the French National Railways Company (S.N.C.F.) was authorised to undertake a programme of works and purchase of equipment amounting to fr. 4,000,000,000; the execution of this programme is to be spread over the years 1940 to 1943 inclusive. In arranging the details of the programme, it appeared necessary to include electrification works, which were likely to prove highly profitable and useful for the general economy of the country. The electrification of the South Eastern Region, including a part of the former P.L.M. lines, is included in the new plans.

In view of the large capital expenditure involved by the electrification, a later Decree has extended the four-year period for the entire programme to five years—1940 to 1944—and the authorised expenditure has been raised to fr. 5,000,000,000. In addition to the

economic and social advantages which this plan offers, it will also form an important contribution to the work of national defence by enabling the S.N.C.F. to improve the equipment and efficiency of the railways.

Reconstruction of Montparnasse Terminus

The Montparnasse terminus in Paris of the main lines running to the west of France is to be reconstructed. The plans for this purpose have been in abeyance since a convention between the City of Paris and the Government was signed on May 5, 1934, but the Municipal Council has recently passed a resolution, which is intended to enable the work to be taken in hand. The present station is to be demolished and rebuilt on the site occupied by the provisional main line terminus. An extensive public garden will be arranged in the Place du Montparnasse on the site left free by the demolition of the existing station buildings. The cost will be met by special local taxes on railway tickets. There was talk at one time of transferring traffic from the St. Lazare station to the new terminus, but, in response to protests from hotel and trade interests in that neighbourhood, a pledge has been given that there will be no change in the existing traffic.

FRENCH AFRICAN COLONIES

Algerian State Railways

The route-mileage of the Algerian State Railways operated, rose from 3,000 km. in 1902 to 4,920 km. in 1937, but fell again later to 4,402 km., due to the closing of certain lines which could not be worked profitably. They are, however, of strategic importance, and could be reopened should need arise. The length of electrified track amounts to 165 km.

New Moroccan Construction

The only new railway line completed during the two years 1937 and 1938, according to a Report on Economic and Commercial Conditions in Moscow, issued by the Department of Overseas Trade (H.M. Stationery Office, 1s. 3d. net), was one 22 km. (14 miles) long connecting the recently inaugurated Ait Amar iron ore deposits with the railway from Oued Zem to Casablanca; nor are there any lines at present under construction. The narrow gauge railways which proved so useful in the early days of the protectorate have now been entirely liquidated.

Moroccan Railway Receipts

The report of the Moroccan Railways for 1938 shows that the operating receipts during the year amounted to fr. 80,063,534, an increase of 20·31 per cent. in comparison with 1937: expenditure was fr. 68,660,120, an increase of 12·49 per cent. The operating ratio thus rose from 85·75 to 91·72 per cent. The kilometric-tonnage of goods traffic was 145,590,000, against 111,035,000 in 1937. In 1938, the tariff for the transport of phosphates was raised by fr. 5 a ton, and this brought an increase of fr. 5,558,013 in receipts. The line from Fez to the Algerian frontier is not included in the operating account, but the receipts in 1938 were fr. 17,111,221 against fr. 12,998,290 in 1937 and fr. 6,955,987 in 1936.

NEW ZEALAND

Tunnelling on the East Coast Construction

On the Wairoa—Gisborne extension of the East Coast line in the North Island the Tikiphata tunnel, 1¾ miles long, is under construction, some 35 miles from Wairoa. Work on the headings is progressing from both ends in three eight-men shifts in the 24 hr., working 40 hr. a week, and the rate of progress is 40-45 ft. a week, through sand stone, drilling being by compressed air and blasting with 50 per cent. gelignite. The broken rock is loaded into trucks with a Sullivan slide scraper worked by a 25-h.p. motor, and the filled and empty trucks are hauled to the portals by two 17-h.p. Planet diesel-engined locomotives. Outside the tunnel a 40-h.p. diesel locomotive is used. Ventilation is provided by a 32-in. Sirocco fan, driven by a 25-h.p. motor. The cost of driving the heading and timbering, but excluding concrete lining is stated by *The Commonwealth Engineer* to be £6 15s. a foot run. The dimensions of the tunnel are 16 ft. 9 in. high x 14 ft. 4 in. wide, the crown radius being 7 ft. 2 in.

UNITED STATES

No Legislation for Railways

The United States Congress has adjourned until next January without having enacted any legislation of any consequence for alleviating the difficulties of the railways. True, both the Upper and Lower Houses of the Congress passed transportation measures of their own, but the two Bills are so different that a conference between representatives of the two Houses will be necessary to bring the Bills into accord. This will be done during the recess period, so that the legislation should be ready for final enactment when Congress reassembles in January.

The legislation in prospect will not, however, work any miracles. The only important innovation it will contain will be a provision for the regulation by the Interstate Commerce Commission of common carriers by water, but, since most of the water carriers are either private carriers or contract carriers, the new legislation will, if enacted, be a victory in the moral realm, rather than in that of dollars and cents.

Sabotage of the City of San Francisco

Attention of rolling stock engineers has been focused on the disastrous derailment of the City of San Francisco diesel streamlined express in Nevada on the night of August 14, caused by the malicious moving of a rail. This is the first serious wreck in which one of these modern streamlined trains has been involved, and consequently there is great interest to learn whether the new cars stood up as well as standard cars might have been expected to do in similar circumstances. So far, no facts have come to light which indicate any marked weaknesses in the new designs, but a final answer to the question will not be available until the wrecked equipment has been thoroughly examined by the engineers. [Pictures of the wreck were reproduced in our *Diesel Railway Traction Supplement* of September 1.—Ed. *R.G.*]

There are no indications that this disaster will cause any waning in the popularity of travel on these streamlined trains. Most newspaper commentators drew attention to the fact that human ingenuity could scarcely be expected to provide safeguards against such rare depravity as the wrecker of this train displayed. The railways which operate the train, the Chicago & North Western, the Union Pacific, and the Southern Pacific, have already replaced the wrecked train with spare cars, and the President of the Union Pacific has announced that two entirely new trains of the "City of San Francisco" type will soon be ordered from the builders.

£300,000,000 for Improved Waterways

The Chairman of the Senate Committee which deals with appropriations for waterways improvements, recently drew attention to the fact that, since 1821, the Federal Government had expended £600,000,000 on improving waterways, and of this total, over one-half has been spent in the past decade. More and more shallow rivers are being dredged to enable them to accommodate barges; and existing waterways are continually being deepened and widened to permit the passage of larger and larger barges, and the users of these waterways pay not one penny toward the cost of these works. Naturally, it is becoming increasingly difficult for the railways to meet this competition, because capital expended for railway improvements must come from private sources; and moreover must yield taxes.

Grandiose schemes for the further development of additional waterways and super-highways are being prepared both in Congress and by the Federal bureaux charged with such construction. For example, the Senate Committee on Waterways has in hand a scheme calling for additional canalisation of streams, involving the expenditure of £80,000,000, and the Bureau of Public Roads is urging the construction of some 25,000 miles of superhighways.

THE ACCELERATION OF PASSENGER SERVICES

A description of the methods used by the countries of the mainland of Europe in speeding-up their train services, with special reference to the track, signalling, rolling stock, and locomotive developments so rendered necessary

IN the June 30 issue of THE RAILWAY GAZETTE we reviewed a report to the International Railway Congress Association describing the methods that have been used during the past five years in speeding up passenger train services in Great Britain, the British Dominions, and by a couple of American railways, with the resulting expenditure. The July issue of the *Bulletin of the International Railway Congress Association* contains similar and extremely detailed reports concerning the railways of the mainland of Europe, those of Germany, Bulgaria, Denmark, Hungary, Norway, Sweden, and Switzerland being covered by Messrs. Rohde, Stroebe, and Fesser, and those of France, Belgium, Greece, Italy, the Netherlands, Portugal, Roumania, and Jugoslavia by Monsieur L. Dumas. The findings of these reports in regard to operation by railcars were dealt with extensively in the *Diesel Railway Traction Supplement* of our July 7 issue, and it now remains to describe certain of the more important conclusions come to by these *rapporteurs* affecting all classes of high-speed transport, both with railcars and steam haulage. Elaborate tables of statistics accompany each report, showing the extent to which acceleration has been carried out in each country, but as these figures are given in the reviews of railway speed developments which appear annually in THE RAILWAY GAZETTE, there is no need to deal further with this aspect of the matter.

Speed Limits

In past years, whereas in Great Britain there have been no over-riding limits to the speed of trains, in Continental countries there has been rigid limitation, considerably lower than the speeds commonly attained in this country. An important factor in acceleration on the mainland of Europe has, therefore, been the raising of these limits, which in turn has entailed much costly track alteration and improvement. In France, for example, over sections of line equipped with automatic block signals, steam and electric trains composed of all-steel stock have had the previous limit of 75 m.p.h. raised to 81 m.p.h., and high-speed railcars have gained an advance to 93 m.p.h. In Belgium the speed limit has been raised from 75 to 87 m.p.h. between Brussels and Bruges, and a maximum of 93 m.p.h. is under consideration. Holland now permits maximum speeds up to 87 m.p.h., and an extension of the limit to 100 m.p.h. is being considered. In Germany the high speed diesel units are allowed to travel at 100 m.p.h., and do so over considerable distances; steam services in general are limited to 75 m.p.h., though with relaxation up to 87 m.p.h. over certain routes. Italy permits the high-speed electric railcars and " electro-trains " to travel up to 100 m.p.h. over certain sections, such as the Rome—Naples *direttissima* or direct line; until comparatively recent years no higher speed than 62 m.p.h. was permitted in Italy. In Roumania the limit of 62 m.p.h. has been increased to 68 m.p.h., and it is hoped to permit a maximum of 75 m.p.h. in the near future. The Danish speed limit has been raised from 62 to 75 m.p.h. In Switzerland the high-speed electric railcars are now run up to 78 m.p.h. instead of the previous 62 m.p.h., and high-speed trains of light stock may travel up to 68 m.p.h.

In preparation for higher speeds, the German State Railway has spent about 33,000,000 RM. in the last ten years. This has included the adaptation of 13,670 miles of track for speeds of 75 m.p.h. and over, the expenditure working out at an average of 2,400 RM. per track-mile. On station layouts an additional 11,000,000 RM. has been spent, at the rate of 3,200 RM. per track-mile at the places so dealt with. In the course of these track improvements, the Reichsbahn has laid 2,500 turnouts of 500-m. (25-ch.) radius, and 500 of 1,200-m. (60-ch.) radius, permitting speeds up to 37 and 62 m.p.h. respectively over the diverging line, or even up to 75 m.p.h. in the latter case, with suitable superelevation. This junction work has cost in all 24,000,000 RM. The Swiss Federal Railways regard it as essential in preparation for higher speeds to peg out and mark the transition points of curves very carefully, in order to ensure exact alignment and to have a ready means at any subsequent time of checking its accuracy; owing to the considerable amount of curvature in this mountainous *terrain*, track improvements have been carried out to a limited extent only, at an average cost of fr. 17,700 Swiss per mile. A certain number of turnouts permitting the raising of the speed limit from 25 to 37 m.p.h. have been laid, at a cost of fr. 4,000 Swiss per turnout, and since 1937 a standard 1 in 16½ turnout of 40 ch. radius has been laid in at important high-speed junctions, permitting speeds up to 50 m.p.h. on the diverging line.

Much notable work has been done at junctions in France to permit higher speeds; at Longueau, for example, where the Arras and Lille main line leaves the Calais line, switches 46 ft. in length have been installed, with a canted divergence of which the radius is 1,300 m. (65 ch.), a speed of 75 m.p.h. being permitted over the diverging line. The crossings of this layout are of cast manganese steel. Such a turnout as this is typical of a number in France permitting speeds of from 62 to 75 m.p.h. over the diverging line. As regards costs of track maintenance, the Reichsbahn authorities consider that these have increased by at least 20 per cent. as a result of the higher speeds, and that lines which formerly required methodical renovation every 3 years must now be gone over every 2 to 2½ years. Other European administrations consider that once the track has been put in good order for high speed, the maintenance costs are practically the same since the acceleration as they were before it took place. The Italian State Railways now level up their high-speed tracks every year, instead of every second year, but on the other hand general overhaul takes place once every four years, instead of once every two years as previously. Practically all railways using high-speed railcars permit them to traverse curves at speeds from 5 to 10 per cent. higher than trains hauled by steam locomotives.

No administration has found it necessary to strengthen underline bridges owing to increased speeds alone, nor has any increase been noticed in the cost of bridge maintenance for this reason. The French National Railways have found by experiment that the most intense vibrations in bridges are produced at speeds between 50 and 80 m.p.h.; and the only bridges that the German Reichsbahn has found in any way affected by higher speeds have

been those located on curves. Such bridge strengthening as has been carried out is entirely attributable to increased axle loads.

Safety Precautions

Moving out distant signals, in order to allow greater braking distance, has been a measure extensively adopted by most principal European railways, especially on those lines over which high speed railcar services are operated. On the German State Railway the distance between distant and home signals has been increased from 2,300 to 3,300 ft., on the Danish State Railways from 1,300 to 2,600 ft., and on certain Swiss routes the distant signals have been moved more than 650 ft. further out. The cost of this work has been high; it is estimated at 3,200 RM. per mile on the Reichsbahn (which has spent in all 25,000,000 RM. on signalling alterations) and fr.610 Swiss per mile on the Swiss Federal Railways; the Danish State Railways have spent an average of Kr.13,000 on each complete station installation. The German railway authorities have also introduced three-aspect distant signals on their high-speed lines, and have improved visibility by providing higher posts, enamelled signal-arms, and reflectors to the signal lamps. To indicate to drivers the location of speed restrictions, the Swiss Federal Railways use speed boards, 2 ft. 7½ in. square, painted with diagonal black and white stripes; there is first a warning board, then, about 1,000 ft. behind it, the board marking the commencement of the restricted length (and showing the authorised speed), and finally, at the end of the latter, a derestriction board, on which the stripes are arranged vertically. The automatic train control system in use on the Reichsbahn has cost 1,200 RM. per mile of single track, and the Signum system used by the Swiss Federal Railways has cost fr.1,160 Swiss per mile to instal. As to level crossings, the Reichsbahn has made no changes in its methods of protection except on lines where speeds exceeding 75 m.p.h. are run. Here, as far as possible, gates and barriers operated from a distance have had operation on the spot substituted, and in many cases such crossings have been replaced by bridges or subways. Where these changes have not been possible or economically justifiable, the crossings on such lines are specially watched, but only at times when high-speed trains are due. The Danish State Railways have introduced more stringent regulations for closing level crossing gates, and are replacing crossings by bridges wherever practicable.

Brakes

In Germany, as a result of the moving out of distant signals, it has been found that at speeds up to 81 m.p.h., the distance of 1,300 ft. between distant and home signals is more than adequate by about 10 per cent. for bringing a train to a dead stand from this speed, with the standard "KKS" brake in use on corridor coaching stock. Steam locomotives for high-speed work have had the efficiency of the brake rigging improved, and have two brake blocks per wheel. For very high speeds, the quick-acting "SS" brake is provided, by means of which the vehicles are braked with a brake-block pressure of 200 to 220 per cent. of the axle-load. A centrifugal regulator, worked by one of the axles, reduces the pressure of the blocks to about 75 to 80 per cent. of the load when the speed falls below between 37 and 31 m.p.h. With this type of brake, a train running at 150 km.p.h. (93 m.p.h.) can be stopped in about 900 m. (2,950 ft.). The French Poncet type of brake is similar to this, with an automatic change-over from high pressure to low pressure braking, at below a certain speed, worked by a centrifugal regulator on the locomotive. The Westinghouse self-regulating high pressure brake is fitted to the latest high-speed Atlantic locomotives in Belgium, and to six triple railcars, and forms part of the equipment of 120 passenger coaches now being built for international service. A regulated type of compressed air brake is used on the high-speed services in Italy, most of which are single railcars or three-car electric units, and similarly in Switzerland. Passenger trains in Denmark are still equipped with the vacuum brake, but the railcars and electric motorcoaches have compressed air brakes, which are ultimately to become standard for all Danish coaching stock; the Bulgarian State Railways also intend to change over from the vacuum to the compressed air brake.

Passenger Rolling Stock

Remarkably successful attempts have been made by several countries to reduce the weight of passenger stock, in order to facilitate the maintenance of higher speeds, by more scientific methods of construction. In Germany, up to 1934, the weight of the standard corridor stock being built for "D" class express trains had grown by degrees to an average of 48 *tonnes* per coach. From 1935 onwards, without any reduction in seating capacity, this weight dropped to 39 *tonnes* per coach, with the free use of welding instead of riveting; in the 1939 type of vehicle this weight has been reduced to 28 *tonnes*, or only 58 per cent. of the original tare. In France, as in other countries, the change-over from wooden to all-steel coach construction resulted at first in considerable weight increases, but here again more modern constructional methods are reducing the tare of coaches. The latest set trains used on the Paris—Havre service of the S.N.C.F. Western Region tare 420 *tonnes* (413½ tons) as compared with the previous weight of stock providing equal accommodation of from 500 to 700 *tonnes* (492 to 689 tons). The S.N.C.F. is now standardising a coach weighing about 39 *tonnes* for main-line use, based on a design developed by the late Eastern Railways, which in its turn replaced a coach weighing 48 *tonnes*. The latest stock of the Western Region weighs 35½ *tonnes* per coach,* and lightened suburban stock introduced in 1937 on the Eastern Region, with a view to acceleration, brought the weight per coach down from 41½ to 31½ *tonnes*. In the Eastern Region stock mentioned, tubular construction of the body-frame and aluminium panelling play a large part. Extensive acceleration of local services in Italy has been carried out by the use of two-car sets of light stock, weighing 70 *tonnes* per train. Much research has been carried out in France in regard to the riding of stock at high speed, chiefly with the Mauzin apparatus, in which use is made of the electrical properties of quartz when subjected to stress. By the use of units embodying this principle, which are carried in coaches, and suitable track recording appliances, measurements are obtained of the transverse and vertical forces exerted by a pair of wheels on the track, of lateral movements of wheels on the rails, of rolling and hunting movements and accelerations in the coach body, and of relative movements between different parts of any vehicle under test. Such measurements are made systematically before any new type of vehicle intended for high speed service is put into operation on the French railways.

Steam Locomotives

On the mainland of Europe there has been very little in the way of new steam locomotive construction during review; the demands of the accelerated schedules, apart from the introduction of railcars, have been met almost entirely by modernisation of existing locomotives. It is in France, where an extensive programme of locomotive reconditioning has been carried out, that the most

* This type of construction was described in THE RAILWAY GAZETTE of May 21, 1937 (page 989).

successful work has been done in this direction. The alterations have had three principal objects, first, to improve the exhaust in such a degree as to lower the back pressure in the cylinder to between one-half and one-third of the former figure; secondly, to increase the superheat temperature from about 570° to about 750° F.; and, thirdly, by increasing the cross-sectional area of the steam passages (to give roughly double the area) to reduce the pressure losses in those passages and the wiredrawing action through the steam ports. Complete conversion, as in the case of the Chapelon Pacifics and 4-8-0s, on the late Paris-Orleans system, and the " H " class Pacifics on the late P.L.M. Railway, meant replacing cylinders, motion, crank axle, exhaust, tube-plates, superheater, and firebox, together with the provision of mechanical cylinder lubrication and feed-water heating; this has cost about fr. 1,000,000 per locomotive, or roughly one-half the present cost of a new engine. Partial conversions, greatly improving efficiency, especially in the matter of exhaust, have been made at roughly 20 per cent. of the present cost of a new locomotive. Certain Paris-Orleans experiments have proved that complete conversion reduced coal consumption per d.b.h.p.-hr. by 54 per cent., and partial conversion by 49 per cent., but whereas partial conversion added only 38 per cent. to the continuous d.b.h.p. at 68 m.p.h., complete conversion added 83 per cent.

Various new experimental types of locomotive are under construction or under test in France, including a super-pressure 4-6-4, a turbine-driven 4-6-4, a series of eight 4-6-4s of conventional design for the Northern Region, a locomotive driven through a longitudinal shaft, and a 4-6-0 locomotive with oil-fired Velox boiler. In Belgium the latest locomotives for high-speed work are a reversion to the Atlantic wheel arrangement, selected for its good riding qualities. An interesting steam development in Germany, accompanied by acceleration, has been the introduction of push-and-pull trains on the Lübeck—Büchen line, now a part of the Reichsbahn, comprising a 2-4-2 tank engine developing 650 h.p. and a twin-articulated double-deck coach unit seating 300 passengers and weighing 73 *tonnes*. Previously the time for this 40-mile journey gave an average speed of 47 m.p.h., which by the use of these push-and-pull units has been increased to 58·7 m.p.h., the maximum speed permitted being 75 m.p.h. In view of the advantage of dispensing with running round at terminals, and the time so gained, the Reichsbahn is to introduce further push-and-pull units for selected routes, with 4-6-4 tank locomotives and ordinary bogie stock adapted for the purpose.

Streamlining

Railways in Europe which have streamlined steam locomotives are unanimous that streamlining has economic value at speeds over a certain predetermined level; that is to say, that it is justified in the case of high-speed services, but not otherwise. The German State Railway authorities have found by experiment that at 87 m.p.h. the d.b.h.p. of a standard 0.3 class Pacific is increased from 800 to 1,185 by the use of streamlining, but that at lower speeds this advantage is progressively reduced. This increased haulage power would permit one of these Pacifics to haul an additional 100 tons at 87 m.p.h. without increased coal consumption, but the acceleration from rest, with this additional load, would be slower than that of a non-streamlined Pacific hauling 100 tons less. Taking an average, therefore, for rostering purposes, the streamlined Pacific is regarded as able to haul 50 tons more than a non-streamlined engine of the same type, or roughly one additional bogie coach in ordinary express train working.

In France the critical speed over which streamlining is regarded as becoming economically effective, when this speed has to be maintained over long distances continuously, is 100 km.p.h. (62 m.p.h.). Trials carried out with a streamlined P.L.M. Atlantic, which at the same time had been reconditioned by fitting with superheater, feed-water heater, and improved exhaust, showed an increase of 25 per cent. in d.b.h.p. at 87 m.p.h., and at the same time some saving in fuel and water consumption, but these improvements were doubtless due in part to the reconditioning. The cost of the alterations to the P.L.M. Atlantic amounted to fr. 207,000 for streamlining engine and tender, and fr. 138,000 for the other alterations; streamlining the engine cost 8 per cent. of its present day price, and streamlining the tender 25 per cent. of its present price. But the complete streamlining of one of the highly efficient rebuilt Chapelon Pacifics of the Paris—Orleans added only 10 per cent. to its d.b.h.p. at 81 m.p.h., though this was sufficient to enable it to haul an additional coach at this sustained speed without any additional fuel consumption.

There are drawbacks in streamlining old locomotives, from the maintenance point of view, owing to the necessity for getting easily at all the working parts of the locomotive, but the matter is simplified when designing a new streamlined type, as it is then possible to group under suitable inspection covers the parts requiring the most frequent inspection. The Italian State Railways do not propose to build any further steam locomotives, in view of the wide extension of electrification over their main lines, but for express passenger work on non-electrified routes they intend to streamline certain of their modern locomotives, at the same time reconditioning them with a view to greater power and efficiency. Actually very little has been done in the mainland of Europe in streamlining steam locomotives, only a few experimental engines having been thus equipped, the reason being doubtless that in all European countries other than Great Britain almost all the ultra high-speed trains, requiring the maintenance of very high speeds continuously, are propelled by internal combustion engines or electricity.

The conclusions come to in these valuable reports are discussed editorially on p. 339, and among them is the remarkable fact that the German State Railway estimates that were its greatly accelerated train services of 1938 to have been reduced in speed to the speed level of 1932, the extra cost entailed in 1938 would have been of the order of 27,000,000 RM.—a saving which amply justifies the expenditure of 106,000,000 RM. incurred in Germany in preparing the main and subsidiary lines of that country for higher speeds.

A NEW TRANSMISSION.—It was intended to show on the stand of the Hydraulic Coupling & Engineering Co. Ltd. at the now-cancelled Shipping & Machinery Exhibition a 350-b.h.p. two-speed planetary Synchro-Self-Shifting (S.S.S.) gearbox. As its name implies, this S.S.S. gearbox is synchronised, and the gear shift is effected shocklessly and positively at the moment of over-run by a helically-mounted dog clutch with a locking control operated by the driver. No baulking rings, or cones, or other frictional devices are used. The gearbox is to be driven for demonstration purposes by a small motor, the output end of the gearbox being connected to a brake drum of sufficient inertia to illustrate the gear-changing principle on a vehicle. The S.S.S. gear has already proved itself in practice, and is available for railcars and locomotives. A small synchro-coupling will be available for demonstrating the principle of the S.S.S. gear-change, which is made without declutching, and is suitable for local or remote control, or automatic gear-change.

XUM

A.T.C. BETWEEN EDINBURGH AND GLASGOW

*By E. D. TRASK**

Chairman, Locomotive Running Superintendent's Committee, L.N.E.R.

THE control of trains, whether worked by steam locomotives, internal-combustion units, or by electricity, is dependent upon the application of the brakes at an appropriate distance from the point at which a stop is necessary. With semaphore signals this distance is indicated by the position of the distant or warning signal in relation to the stop signal. In the majority of instances brake application is entirely dependent upon action being taken by the driver, and he takes this action according to the signals exhibited. It is common knowledge that a driver sights every signal on his route; when running at speed the prompt sighting of distant signals is most important.

In order to assist enginemen in this task, and also to overcome the difficulties experienced at times of bad visibility, particularly during falling snow and in fog, various devices have been tried out in former years, and three or four different types of apparatus are in use on other railways today. On several of the constituent companies of the London & North Eastern Railway, prior to grouping, two different forms of automatic train control were in use. On the former Great Central Railway a mechanical device operating from the vacuum brake and known as the Reliostop was in use at the London end of the line. This apparatus gave an audible warning to the driver at each distant signal; also, if a stop signal was at danger, a trigger connected to the signal and working in conjunction with it caused a full application of the vacuum brake, so that the train would be stopped shortly after passing the signal. This apparatus was withdrawn from use a few years ago.

On a main-line section of the former North Eastern Railway the track was equipped with ramps, and all engines working over this section were fitted with an apparatus known as the Raven fog-signalling device. This gave an audible warning to the driver in the vicinity of distant signals. Both of these devices were dependent upon the direct contact of some fitting on the engine with a fixture on the ground; consequently both engine fittings and track equipment were liable to considerable wear—a disadvantage, particularly when engines are running at high speeds.

After consideration of the various systems formerly and at present in use, it was decided to introduce a system of automatic train control known as the Hudd system for use on the main line between Edinburgh and Glasgow (*via* Falkirk). The newly-installed apparatus was used for the first time on August 13, beginning being made on that date with a small number of track fittings as an experimental measure. Further fittings will be installed until this section of the line is wholly equipped.

The Hudd system of A.T.C. has been in use for a

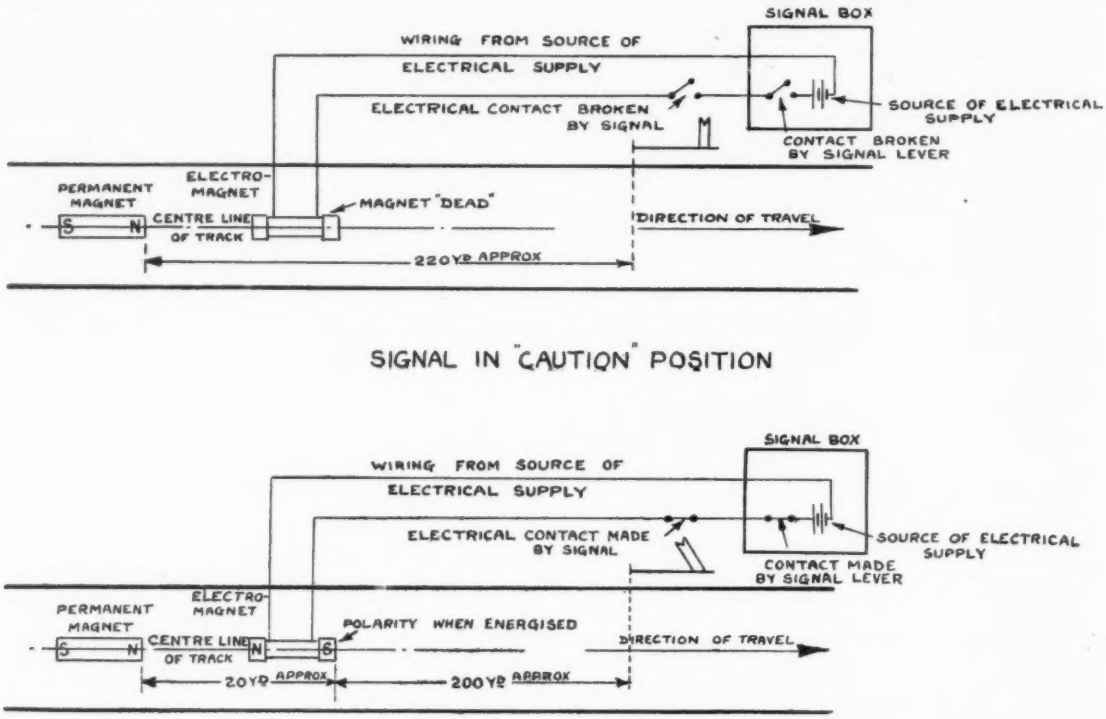
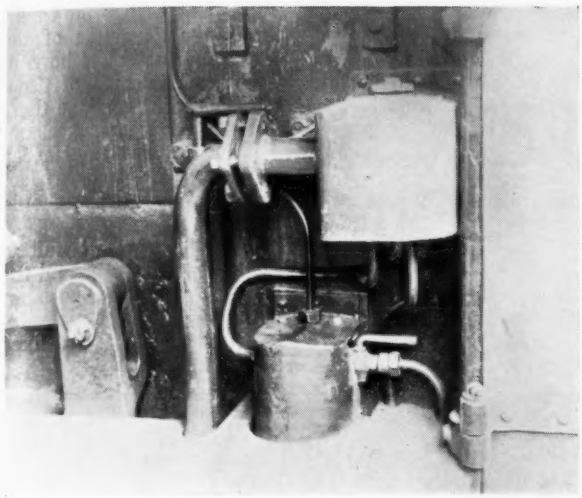


Diagram of track equipment in the A.T.C. installation between Edinburgh and Glasgow, L.N.E.R.

* Reproduced by permission from the *L.N.E.R. Magazine*



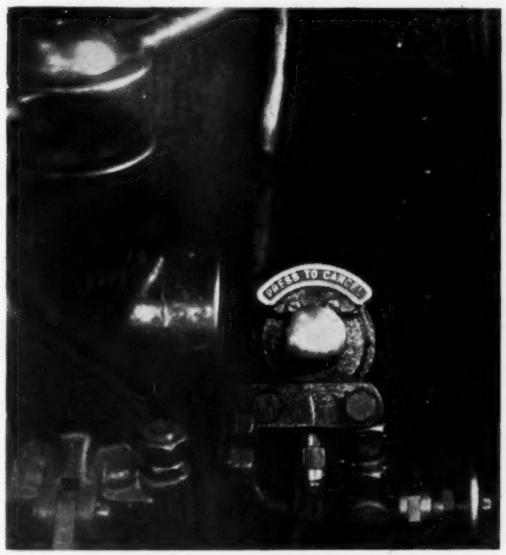
Horn valve and A.T.C. brake valve

few years on the Southend—London section of the L.M.S.R., and has given very excellent results. The apparatus works on the electro-magnetic inductive principle, and it fulfils its functions without any direct contact being made between the locomotive fittings and the track equipment. Such a condition is accomplished by utilising magnetism as the main medium for operating the various parts of the mechanism. In normal conditions the fittings on the engine are 4 in. clear of the actuating magnets in the track, and such is the magnetic power radiating from these magnets that they are fully effective at twice this distance. Because of the absence of any direct contact between the operating mechanisms on engine and track, this apparatus can be used for trains running at any speed with entire immunity from risk of undue wear taking place. The Hudd system of A.T.C. is operated by powerful magnets placed in the centre of the track, the operation of the mechanism on the engine depending upon the relative positions of their north or south poles. When the engine passes over the north pole of a magnet the apparatus commences to operate; when it passes over a south pole, the operation of the apparatus is automatically cancelled out. In order to avoid confusion, a useful slogan is " North last—Brake fast." The two distinct groups of equipment are:—

(1) Magnets and equipment necessary for the installation on the permanent way.

(2) Apparatus and necessary fittings on the locomotive.

Track equipment is installed at distant signals only. The general arrangement can be followed readily by reference to the diagram. Each complete set comprises a permanent magnet placed about 220 yd. on the approach side of the signal post, and always set with the north pole nearest the signal, also an electro-inductor magnet which is placed about 20 yd. nearer to the signal. As its name indicates, the permanent magnet always retains its magnetism. The electro-magnet is neutral unless its surrounding coils are charged with electricity; it then becomes magnetic. The electro-magnet is synchronised with the signal, so that when the signal is off, the end of the inductor nearest to the signal has a south polarity, and consequently an engine passing over both the permanent and electro-magnets will first of all have its apparatus operated by passing the north pole of the permanent magnet; this immediately sounds a horn in the engine cab. The operation will then be cancelled out by the engine passing over the second magnet (the electro-inductor) by the action of the magnetism from its south pole.



Cancelling plunger in locomotive cab

Receiving unit on leading end of locomotive

When the signal is at danger no electricity is passing through the coils of the second magnet, and therefore the action generated by the permanent magnet remains unchanged, consequently the horn continues to sound; also after a short interval of time the train brake is applied and the train automatically

brought to a stand before it reaches its stop signal. Such an operation can, however, be cancelled by the driver should there be no necessity to bring the train to a stand.

The permanent magnets used are of the plain bar type, 2 ft. long by 6 in. wide, placed longitudinally in the centre of the track with the top surface slightly above rail level, always with the south pole pointing towards oncoming trains. A short distance away, and nearer to the signal, the electro-magnet is placed longitudinally, also in the centre of the track, and energised only when charged with electricity, that is, when the signal is off; under all other conditions the electro-magnet is dead. The remainder of the track equipment is merely the necessary wiring to the supply of electricity and appropriate contact switches.

The locomotive carries a receiving unit (usually at the leading end) fixed immediately over the centre of the track, and this unit is sensitive to the magnetic action of the track magnets; in it is a device which actuates the horn in the engine cab and also, after a short interval of time, applies the vacuum brake. In the cab of the engine there is a special device which enables the driver to cancel out any brake application made by the apparatus. Having made a cancellation, it will, of course, be necessary for him to make a normal application of the brake should his stop signal be still against him.

The photographs reproduced show the receiving unit as fixed to the leading end of a Pacific type engine, and the principal fittings in the cab. Prominent among the latter are the cancelling plunger, the horn valve, and the automatic train control brake valve—the two last-named fixed under the seat on the driver's side of the cab.

MECHANICAL STOKERS IN FRANCE

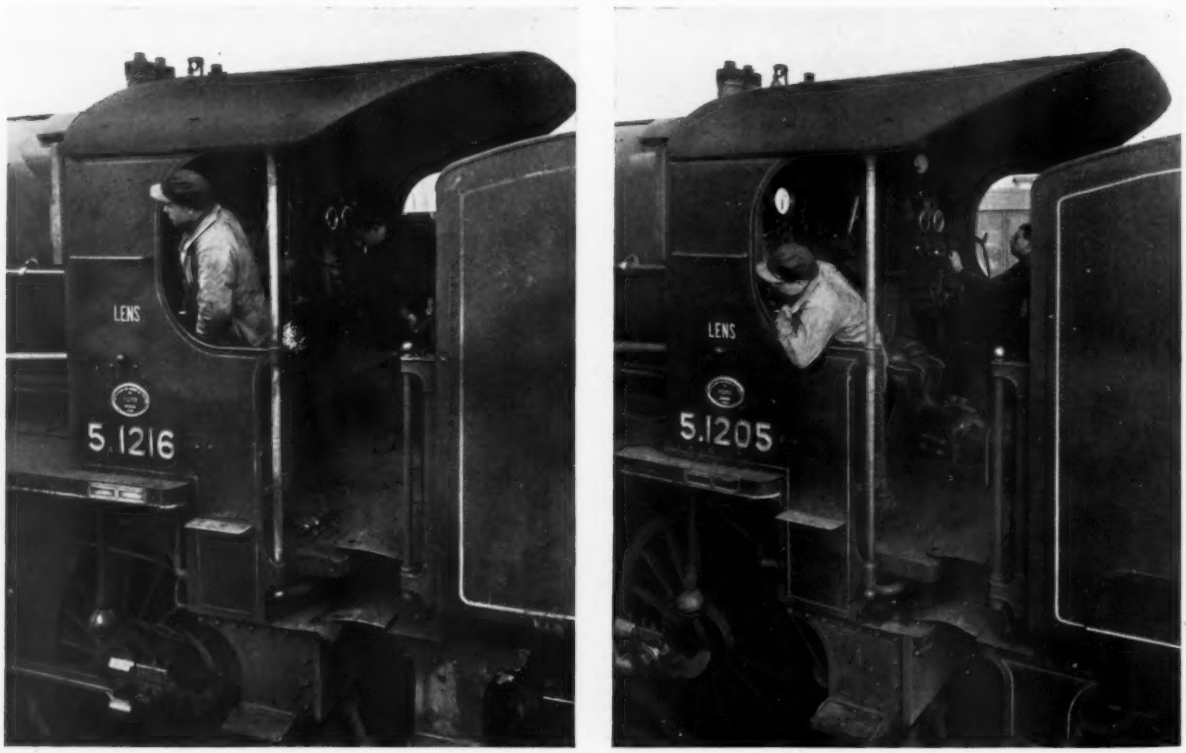
Locomotives of the 2-10-0 and 4-6-2 types have recently been fitted with mechanical stokers

IN order to reduce the amount of firing on the 2-10-0 locomotives of the former Northern Railway of France which work the coal trains between the northern coalfields and Paris, the French National Railways have fitted mechanical stokers to seven engines of this class.

The coal is transferred from the tender by an archimedean screw, enclosed in a trough-shaped casing. The top of the trough is partly closed by sheet steel slides which can be moved by hand to regulate the flow of coal into the trough. The screw is operated by a small steam engine installed at the rear end of the screw shaft. At the front end of the trough a steel crusher plate is provided. Lumps of coal carried along by the screw are pressed against this plate and crushed sufficiently finely to be handled by the rest of the installation.

The screw ends at the level of the front of the tender; its end is enclosed in the ball of a ball and socket joint. The socket is formed by the end of a section of tube forming an extension of the tender trough. Inside this tube another screw connects with the first by a cardan joint. The crushed coal is fed to this screw by the screw in the tender trough and carried along towards the firebox.

The end of this second section of tube again forms a



2-10-0 locomotives in France with (right) and without mechanical stoker

French stoker-fired 2-10-0 *locomotive on long-distance coal train*

ball, the socket of which is part of the stoker proper, bolted on to the fire door of the locomotive. This stoker consists merely of a cast steel piece, which widens from a diameter of the same size as the feed tube to an oval corresponding to the width of the fire door. No screw is provided inside this piece; the coal is raised therein by the pressure of the fuel forced into it from the bottom by the feed screw.

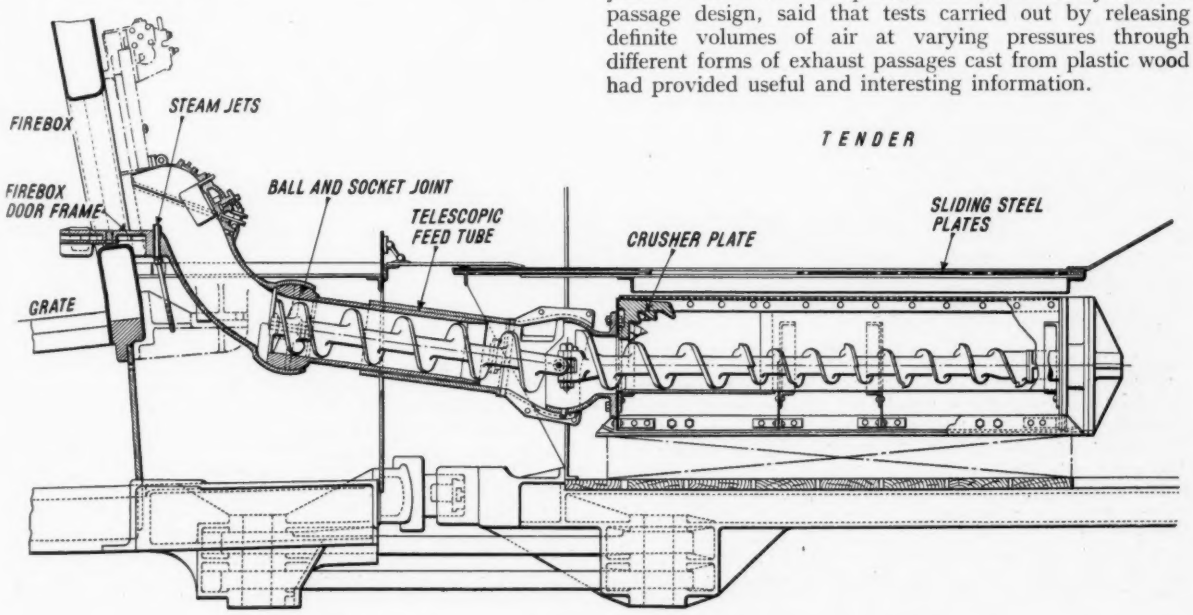
Across the top of this piece, and forming a sort of roof near its opening into the firebox, is a flat inclined plate. Along the floor of this and near the edge of the opening into the firebox there is a series of steam jets, and as the coal is pushed forward it approaches these jets. The steam escaping from them provides sufficient force to blow the grains of coal up against the sloping roof plate, from which they are carried, partly by the rebound from the roof and partly by the flow of the steam, into the firebox. By using sufficiently fine grains and by suitable calculation of the steam pressure and the angle of the roof, it is possible to obtain a fairly even distribution of the coal over the whole surface of the grate.

This stoker system, experimentally fitted to seven 2-10-0, and to two 4-6-2 express locomotives also, has proved quite successful. It is capable of feeding one ton of coal per sq. m. (10·8 sq. ft.) of grate surface an hour—this makes its output $3\frac{1}{2}$ tons an hour. At this rate of combustion, an evaporation of 100 kg. of water an hour per sq. m. (20·83 lb. an hour per sq. ft.) of heating surface is obtained.

It is stated that this rate of steam production is slightly less than would be obtained if the locomotive were fired by hand, so that hand firing would seem to save fuel. The stoker, however, gives a saving in cost as the extra fuel consumption is more than compensated for by the possibility of using a cheaper quality of coal. The difference is described as very slight.

Because of the success of the experiments, involving the operation of nine 2,000-ton trains daily, the French railway authorities have decided shortly to equip a further 23 2-10-0 locomotives with the system. They will be used, like those now in service, on accelerated goods trains.

LOCOMOTIVE BACK PRESSURE.—An interesting statement was recently made by the head of a locomotive manufacturing concern in America, who, in dealing with the subject of locomotive back pressure as influenced by exhaust passage design, said that tests carried out by releasing definite volumes of air at varying pressures through different forms of exhaust passages cast from plastic wood had provided useful and interesting information.



Section through mechanical stoker being tried by the French National Railways

Railways at New Zealand Centennial Exhibition

In November the New Zealand Centennial Exhibition opens in Wellington and will remain open for six months. From the railway point of view the most striking feature of the exhibition will be the Railways Court, 182 ft. long by 36 ft. wide, fitted up to represent the national railway system in full operation and show prospective developments. Throughout the whole length of the court at floor level and to a width of 15 ft., rising to a height of 6 ft., there will be a full-relief model of a typical area in the Dominion through which a railway in miniature will run. Above this realistic landscape will be a platform, with a complete range of actual railway mechanical and electrical exhibits. Curved stairways will give easy access to each end of the platform, from which also the railway can be viewed, as well as from the floor. As a suitable background to the working and stationary exhibits there is to be a mural decoration, 136 ft. in length and 6 ft. in depth, depicting the progress of the country's railways from the beginning to the present year, with impressions of probable developments. This historic mural will be flanked by maps of New Zealand, showing the whole system of rail and road services and the lines under construction.

The Model Railway

The main feature, the model railway itself, will be $\frac{1}{2}\frac{1}{4}$ full size and complete in every detail to ensure a memorable demonstration of the various operations. There will be a suburban station of the island type, with platform and verandahs, locomotive running shed and goods shed—all electrically lighted—station and goods yards lighted by two floodlight towers, loading bank, two tanks, turntable, viaducts, under- and over-bridges, tunnels, cattle stops and other incidentals.

The total length of track will be 1,000 ft., including about 775 ft. of main line, of which 500 ft. will be visible; there will be 24 sets of points and crossings. The station yard points will be operated by electric mechanisms and, together with yard signals, be controlled by a full-sized 23-lever all-electric interlocking frame with an illuminated diagram of the yard in the control box, visible to the public on the exhibit platform.

At junctions of single and double-line tracks automatic points will be operated by approaching trains; a miniature level crossing is to be fitted with automatic flashing lights. The movements of trains will be controlled by automatic colour-light signals spaced around the visible part of the track. There will be 19 single-unit and four double-unit colour-light signals operated by 35 track circuits. In operation, a signal at "danger" will automatically cut off the traction feed, thus stopping the train; immediately the signal clears, power will be restored for the train to restart. Station yard signals will be controlled by the interlocking frame.

One of the trains will be an accurate model of the Limited express, consisting of a "K" class locomotive, two first class and three second class carriages, two sleepers, and a van, with 320 passengers. The other is to be a complete goods train consisting of vehicles for horses, cattle, sheep, pigs, calves, chilled meat, fruit, coal, motorcars, luggage, and a brake-van. There will also be working models of railcars of the New Plymouth type and of the multiple-unit type, consisting of a railcar and trailer.

Rolling-stock, station buildings, passengers, staff and live-stock will be painted in true detail, and there will also be model trees, houses, motorcars, ships, and persons for the landscape setting.

Full-Size Exhibits

The exhibits on the platform will include a representative selection of types of work produced and operated by the various branches of the Railways Department. For instance there is to be a working all-electric interlocking frame; the cab of a "Ka" class locomotive; an air-conditioned sleeping compartment; a section of 85-lb. track; an exhibit of castings and forgings; and a large range of other interesting railway features.

There will be plenty of movement in this portion of the railway court, as well as on the model railway, for the department is arranging to have demonstrators to set many of the working parts in motion, and the public will be able to go through and inspect the details of most of the exhibits, and even personally operate some of them.

Securing Locomotive Parts by Shrinkage

In THE RAILWAY GAZETTE of February 8, 1935, there appeared an article entitled "New Method of Fitting Cylinder and Steamchest Liners" which explained a system then recently adopted at the Swindon works of the Great Western Railway for scientific shrinking of locomotive cylinders and steamchest bushes by immersion in carbon dioxide. This method utilises the freezing qualities of solid carbon dioxide or Drikold (marketed by Imperial Chemical Industries) and the details of the system were explained in the article referred to.

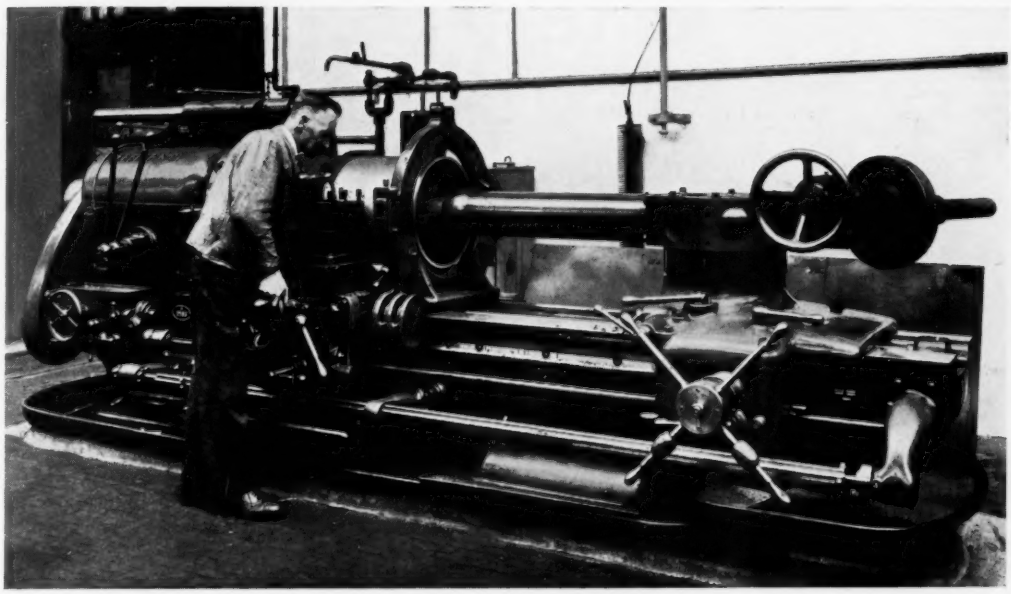
More recently a method known as Dryal has been introduced in America, and this is described in an article published in the August issue of our American contemporary the *Railway Mechanical Engineer*. The author, Mr. R. T. Peabody, who was responsible for the working out of the details, states that a demonstration recently made indicated that through the use of the Dryal system locomotives can be built at almost perfect tolerance fits. In the demonstration referred to a crankpin was immersed in a dry ice and alcohol solution for thirty minutes, which reduced the pin temperature to minus 60° F., and while the pin was in the solution the entire wheel centre in which it was to be fitted was heated with live steam to 180° F. so that it expanded evenly. Before cooling the pin and heating the wheel centre the pin diameter was 9·341 in. and the wheel bore 9·331 in. indicating a shrinkage tolerance of 0·010 in. After the pin had been chilled in the solution it was lifted out by an overhead crane, transferred to the wheel centre and carefully placed in position by means of its own weight and with plenty of space to spare. The pin dropped into position without any hammering or pressure and with no friction. A pressure of 275 tons was required to remove the pin, or 75 tons more than for pins inserted by the hydraulic method.

The pin remained true to form while the bore measured 9·337 in. along the centre line and 9·335 in. at 90 deg. straight, proving that there was a close fit throughout the length of the 10-in. opening in which the pin fitted, a condition it had been previously found impossible to secure by the hydraulic press fit method. The hole in the wheel centre was found to be in perfect condition, the micrometer measurements indicating only 0·002 in. out of round. The pin was tested metallurgically as to the effect of the intense cold on the metal and the grain structure and physical properties were proved to be unaltered. The Dryal method is capable of being extended to the application of cast iron, steel and bronze locomotive bushings. It is stated that in order to obtain the proper fit, tolerances based on little less than 0·001 in. per inch diameter are most important.

NEWQUAY STATION IMPROVEMENTS.—The final instalment of improvements authorised by the Great Western Railway at Newquay station will be the last link in the company's scheme for providing better facilities on the Newquay branch line from Par. It comprises the reconstruction of the major part of the station, and includes new station buildings with modern booking facilities, parcels and cloak rooms, offices and refreshment kiosk, together with a covered concourse in front of the platforms. The work also includes the extension of the platforms and their coverings, an extended goods shed and a new signalbox. The station yard will be enlarged and there will be provision for car parking, and a repair depot and garage for the company's road vehicles.

MACHINING CYLINDER LINERS AT SWINDON, G.W.R.

New Herbert lathe effects a considerable time reduction



CONSIDERABLE numbers of locomotive cylinders on the Great Western Railway are being renovated during repairs at Swindon works when they have been bored out to the maximum allowed, by fitting cast iron liners while the cylinders remain on the frames. The machining of these liners was formerly carried out on a vertical boring machine generally used for work of larger diameter, and in order to reduce the machining time a new Herbert No. 21 combination turret lathe has been installed; this machine is illustrated at work. The liner is cast to suit special jaws in a 24-in. concentric chuck and, after boring and turning, is parted off to the length desired. The following operations are involved in the machining:—

1.—Facing on the end and boring to take the revolving centre (shown in the accompanying illustration in one of the idle positions on the turret).

2.—Rough turning on the outside to accommodate the fixed steady from the square turret.

3.—Rough boring with boring head, using two tools and the pilot bar. The outside of the liner is rough turned by the tool in the square turret simultaneously.

4.—Boring to finished size with one tool in the boring head and without pilot bar.

5.—Turning on the outside to finished size from the square turret, for which operation the revolving centre is used.

6.—Cutting off to finished length.

The tooling equipment for this machine was produced in the Swindon works and consists of the fixed steady boring head with pilot bar and revolving centre mounted on Timken roller bearings. All the cutting tools, with the exception of the parting-off tool, are tipped with tungsten carbide alloy, for which suitable speeds are provided in the lathe. The machine is driven by a 30-h.p. motor mounted on rails with Texrope drive.

A considerable reduction in machining time has resulted, with the additional advantage of reducing the time required to finish machining after the dimensions of the bored-out cylinders are available. It is the practice to keep liners in stock partly machined, so that they may be completed rapidly upon allocation to an engine under repairs. The liners are inserted by contracting them by the use of a trichlorethylene bath, reduced in temperature by solid carbon dioxide, as previously described in our columns.

Weymouth Station Reconstruction

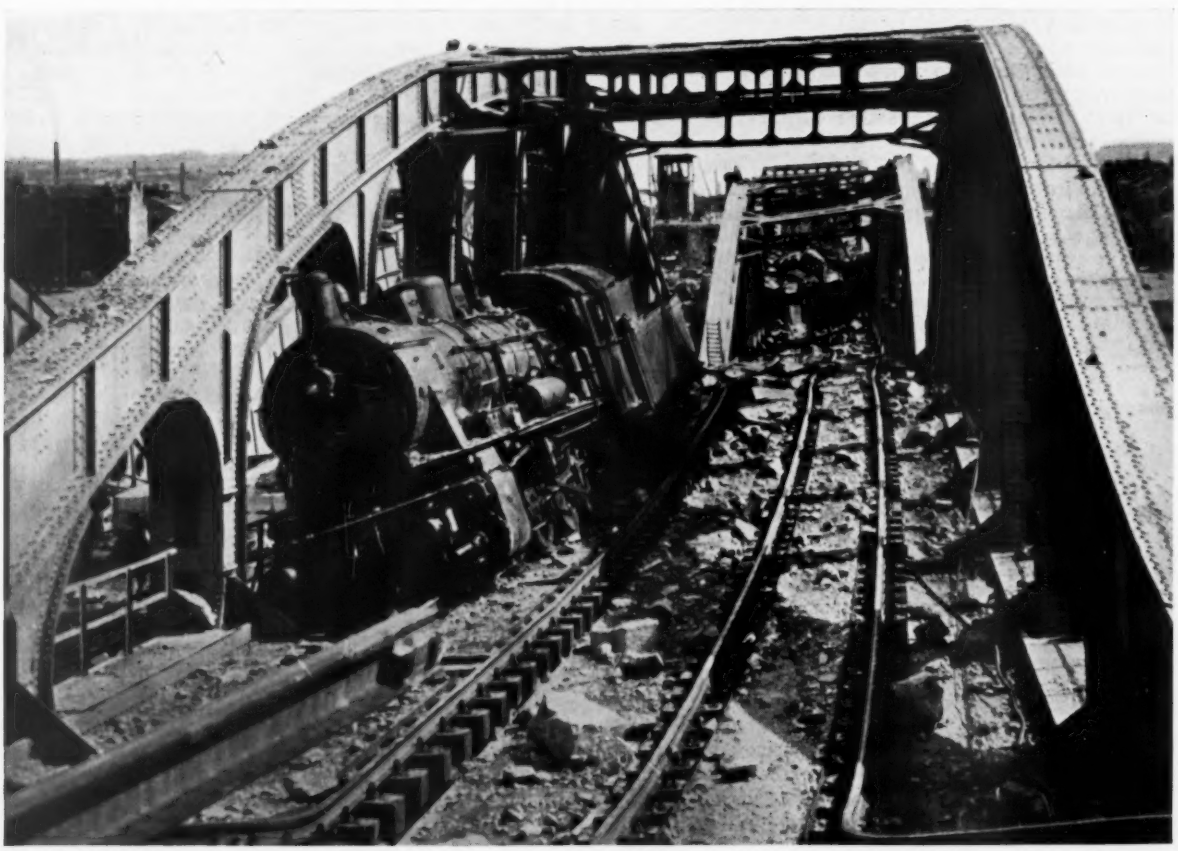
Weymouth now has a residential population of some 35,000 people, and this number is more than doubled during the summer season. During the holiday season as many as 20 inwards and 20 outwards excursion trains are dealt with at Weymouth in a day, conveying some 17,000 passengers, while over 1,250,000 tickets are collected in a year there. In order adequately to meet the present and future transport requirements of the town, a large scheme of improvements has been authorised.

The scheme includes the provision of an additional arrival platform, 900 ft. long, on the Ranelagh Road side; lengthening of the existing platforms, with ample verandah coverings; and the erection of new station buildings. The buildings will comprise a covered circulating area giving access to the various rooms and platforms, booking hall, waiting rooms, cloakroom, parcels office, &c., which will be constructed facing King Street on the site of the existing platform lines, the site of the existing buildings becoming available for incorporation in a spacious area for road vehicles using the station. New staff offices will be built on the west side of platform No. 1. In addition, an up-to-date central signal box will be built, containing 130 working levers, to take the place of the existing junction and station signal boxes, while the permanent way layout will be extensively remodelled and improved.

Above: Typical sandbag protection at a passenger station on the L.N.E.R.

Evacuated London schoolchildren changing over from an L.P.T.B. train to one of the main-line services at an interchange station. Over 600,000 children, teachers, and parents were evacuated from London in three days without a hitch

Below: The new Vierendeel girder bridge over the Val Benoît at Liége on the Brussels-Aachen line of the Belgian National Railways, after being struck by lightning on September 1. The bridge had been mined for frontier defence, and the lightning struck the dynamite charge at a time when two trains were passing over the bridge. Ten people were killed and a dozen injured



RAILWAY NEWS SECTION

PERSONAL

RAILWAY EXECUTIVE COMMITTEE

On September 1, the Minister of Transport made an Order taking control of the undertakings of all the principal railways in Great Britain, as recorded in the news article on page 358. The Railway Executive Committee consists of Sir Ralph Lewis Wedgwood, C.B., C.M.G. (Chairman); Sir James Milne, K.C.V.O., C.S.I.; Mr. C. H. Newton; Mr. Frank Pick; Mr. Gilbert Savil Szlumper, C.B.E.; and Sir William Valentine Wood. These are to be the agents of the Minister of Transport for the purpose of giving directions under the Order.

Mr. H. W. F. Freer, who, as recorded in our issue of June 23, has been appointed Mechanical Engineer, Ceylon Government Railway, was trained as a premium apprentice with the Great Southern & Western Railway, Ireland, which he entered in 1915.

Mr. H. W. F. Freer

Appointed Mechanical Engineer, Ceylon Covernment Railway

He served one year with the Royal Air Force during the war, and returned to the railway in 1919, after which he served with that company and with the Great Southern Railways in the drawing office and the Works Manager's office. In 1930 he was appointed by the Secretary of State for the Colonies to be Assistant Mechanical Engineer of the Ceylon Government Railway, and in 1935 became Deputy Mechanical Engineer of the railway, from which position he has been promoted.

Mr. E. A. Richards, who, as recorded in our issue of August 18 retired recently from the position of Welfare Officer, Southern Railway, was appointed Assistant to the General Manager for General Welfare Work when the position was first created in 1925. He entered the former London Chatham & Dover Railway in 1893, and was later transferred to the office of the Outdoor Superintendent at Victoria. On the

Mr. E. A. Richards

Welfare Officer, Southern Railway, 1925–39

formation of the S.E. & C.R., Mr. Richards was attached to the Office of the Superintendent of the Line, eventually becoming personal clerk to the Superintendent. After experience as Assistant to the London District Traffic Superintendent from 1916-18, Mr. Richards was appointed Assistant to the Eastern District Traffic Superintendent at Ashford. During 1919 he was especially detailed to act as Secretary to the committee representing the Standing Committee of General Managers for dealing with staff and labour agreements. Mr. Richards was appointed Assistant Divisional Operating Superintendent, Eastern Division, Southern Railway, in 1923, and thence to the post of Assistant for General Welfare Work. Evidence of the esteem in which he was held is furnished by the fact that recently 700 members of the staff were present at a dinner given in his honour when he retired. Mr. Richards has also been the recipient of many gifts from the various staff welfare associations with which he was connected. Until the amalgamation of 1923, Mr. Richards was connected entirely with the constituents of the S.E.C.R.

Mr. A. Endicott, M.B.E., F.S.I., who, as recorded in our issue of August 11, has been appointed Estate and Rating Surveyor, Southern Railway, as from October 1, was educated at Tiverton. He was articled in 1903 to a well-known firm of land agents and surveyors at Weston-super-Mare and remained there till the war, when he was commissioned in the Royal Flying Corps and served under the late Sir Henry Fowler, K.B.E.—formerly Chief Mechanical Engineer of the L.M.S.R.—as Officer-in-Charge of Labour and Housing at the Royal Aircraft Factory, Farnborough. Mr. Endicott became Director of Housing Management in the Ministry of Munitions in 1919, and was thus in charge of about 10,000 houses on some 30 estates throughout the country. When the work of that Ministry passed to the Office of Works, he remained responsible for these estates under the Director of Lands and Accommodation. In 1926 Mr. Endicott took over charge of the branch of the Directorate responsible

Photo] [Lafayette

Mr. A. Endicott, M.B.E., F.S.I.

Appointed Estate and Rating Surveyor, Southern Railway

for the acquisition and management of property required for Government (civil) purposes in London and the South and East of England. He was awarded the M.B.E. in recognition of his services to the department in 1930. Mr. Endicott was appointed Surveyor and Estate Agent to the Southern Railway on January 1, 1936.

Mr. F. C. Yapp, Director of Vickers Limited and Vickers-Armstrongs Limited, has been appointed Deputy Chairman of Vickers-Armstrongs Ltd.

B.A.G.S. AND W. MANAGEMENT

Mr. Robert Montgomery, Chief Accountant, Buenos Ayres Great Southern and B.A. Western Railways, has been appointed Deputy General Manager of both companies, and will act as General Manager in the absence of that official.

Mr. H. N. Anderson, General Manager of the Buenos Ayres Midland Railway, and Assistant to the General Manager of the B.A.G.S. and B.A.W. Railways, has been promoted to Assistant General Manager of both companies.

Mr. Robert Montgomery, who, as recorded above, has been appointed Deputy General Manager of the Buenos Ayres Great Southern and Western Railways, went to Buenos Aires in 1908, and was associated with the accountancy firm of Messrs. Isaac Cook & Company until 1914, when he joined the Córdoba Central Railway as Assistant to the Chief Accountant; in 1915 he was named Chief Accountant. In January, 1926, on the retirement of Mr. J. J. Waite from the position of Chief Accountant of the B.A. Great Southern Railway, Mr. Montgomery was appointed his successor. In 1935, following the unified working arrangement between the Southern and Western Railways, he was named Chief Accountant of both companies, as also of the B.A. Midland Railway. On several occasions he has relieved the General Manager in an acting capacity. He is a Member of the Institute of Accountants and Actuaries of Glasgow.

Mr. H. N. Anderson, whose appointment as Assistant General Manager, Buenos Ayres Great Southern and Western Railways is recorded on this page, entered the service of the B.A.G.S.R. in 1900 as a junior clerk, occupying various posts in the management until the outbreak of the war, when he joined the British Army. He served with the Royal Scots in Salonica, and later in Mesopotamia as Personal Assistant to his former Chief, Major-General R. de Candolle, C.B., Director-General of Transportation, whom he subsequently accompanied to Constantinople, where he served on the Military Control and Operating staff of the Anatolian Railway in the capacity of Assistant Manager, with the rank of Major. In 1921, Mr. Anderson rejoined the B.A.G.S.R. as Personal Assistant to the General Manager, and in 1928 was promoted to Assistant to the General Manager. On the appointment in July, 1935, of Mr. C. R. S. Harris as Director-General of the B.A.G.S. and B.A.W. Railways, Mr. Anderson was selected as his Assistant, occupying this position in conjunction with that of General Manager of the Midland Railway (to which he was appointed in 1936) until being promoted to his new post.

We regret to record the death on August 25 of Brig.-General Arthur Asquith, a Director of the San Paulo (Brazilian) Railway Company and numerous other concerns, including the Westminster Bank. Brig.-General Asquith had a brilliant record in the war. He joined the R.N.V.R. on the outbreak of hostilities in 1914 and was given a commission as sub-lieutenant in the Royal Naval Division. He served with that division at Antwerp and Gallipoli and in 1916, with the rank of Lt.-Commander, accompanied it to France. He was awarded the D.S.O. with two bars and was three times wounded. In the closing stages of the war he was Controller of the Trench Warfare Department of the Ministry of Munitions and ultimately retired from the army with the honorary rank of Brigadier-General. After the Armistice Brig.-General Asquith became Controller of the Appointments Department and a Member of Council of the Ministry of Labour.

The funeral took place at Clovelly on August 28, and a memorial service was held at St. Bartholomew-the-Great, Smithfield, on August 29.

Mr. F. C. W. Christison retired on July 11 from the post of Secretary to the South Australian Railways Commissioner, and has been succeeded by Mr. P. F. Cherry.

Mr. F. C. W. Christison was educated at Adelaide Collegiate School (subsequently merged into Queen's College), and entered the Traffic Auditor's Office, South Australian Railways, in 1891. In 1895 he was transferred to the office of the Railways Commissioner, where he occupied numerous positions up to his appointment as Chief Clerk in that office in November, 1925. Mr. Christison was appointed Secretary to the Commissioner in 1936. Out of his 48 years' service with the S.A.R. Administration, Mr. Christison spent 44 years in the Commissioner's office.

Mr. Robert Montgomery

Appointed Deputy General Manager, Buenos Ayres Great Southern and Western Railways

Mr. H. N. Anderson

Appointed Assistant General Manager, Buenos Ayres Great Southern and Western Railways

Mr. F. C. W. Christison

Secretary to the Commissioner, South Australian Railways, 1936–39

G.W.R. BALLAST SUPPLY.—An existing source of ballast at Nantyglo will shortly become exhausted and arrangements have been made for another tip at Merthyr, belonging to the G.W.R. and known as Church tip, to be worked. In connection with the opening of the new tip, which contains about one million cubic yards of slag and will meet the company's requirements for about twenty years, numbers of sidings are being laid down, and it is hoped to have this new source of ballast in working order very soon.

STAFF AND LABOUR MATTERS

The National Service (Armed Forces) Act

The National Service (Armed Forces) Act, which was passed through all its stages in Parliament on September 3, provides that every male British subject in Great Britain between the ages of 18 and 41, shall, from time to time by proclamation, become liable to be called up for service in the armed forces of the Crown. Persons who become liable for service will be required to furnish particulars of themselves when notified. Their names will be entered on the Military Service Register and a certificate of registration will be issued to them. If a person expresses a preference for naval or air service, this preference will be recorded in the register. The certificate of registration must be produced when demanded by a police constable in uniform.

Men liable for service will receive written notice to present themselves for examination by a medical board. After examination they will be served with enlistment notices calling upon them for service in a specified branch of the armed forces. They will not have to present themselves earlier than the third day after service of the notice. Until the end of the present emergency the Military Training Act, 1939, ceases to have effect, and no person is liable to be called up for training under that Act. Men already registered under this Act are, however, liable to be called up for service.

Employers are required to reinstate men called up for service " in an occupation and under conditions not less favourable " than would have been applicable had the employees not been called up. Failure to do so may entail a fine of not more than £50, and the employer may be ordered to pay 12 weeks' remuneration to any man whom he has failed to reinstate. An employer may, however, plead in defence that it is not reasonably practicable to reinstate a man, or that he has offered to reinstate him under the most favourable conditions reasonably practicable. The engagement of some other person to replace the man called up may not be pleaded in defence. Contracts of service or apprenticeship may be modified or extended by order of the Minister, or the parties to such contracts may be relieved of any or all of their obligations under the contracts.

Dilution of Labour

An agreement providing for the dilution of labour in the engineering industry, subject to certain conditions, has been arrived at between the Engineering and Allied Employers' National Federation and the Amalgamated Engineering Union, which has a membership of nearly 400,000. An official joint statement was issued in London on August 31 indicating in general the terms of the agreement, which was ratified at a private conference of the National Committee of the A.E.U. in Manchester.

The outstanding feature of the agreement is that it will have the effect of relaxing for the present certain trade union restrictions and the speeding up of the armaments programme. Skilled labour will be supplemented by unskilled or alternative labour where it is proved that there is not sufficient skilled labour. Hitherto the A.E.U. has resolutely opposed any form of dilution.

The joint official statement issued on August 31 was as follows:—

Negotiations have been going on between the federation and the A.E.U. in relation to skilled men who are members of the union. An agreement has been arrived at to provide for peace-time emergency conditions.

The rapid expansion of armaments production has put a strain on the industry, and the addition of large new factories may further develop a situation where the fullest production would be prejudiced. In order to provide for this and to supplement the skilled man-power, where it can be shown that skilled men are not available and production is prejudiced it is now agreed that an alternative class of worker may be employed on jobs hitherto done by skilled members, and the union, under reservations, mutually accepted.

Such changes may be made if approved by a joint committee of the local employers and the union. A national joint committee will have the situation constantly under review. Any change made under this agreement shall be registered, and such registers shall be kept by the respective parties. When the situation no longer calls for special measures a return will be made to the pre-agreement conditions.

The Turkish State Railways

The Turkish State Railways are making considerable progress, according to the Report on Economic and Commercial Conditions in Turkey, issued by the Department of Overseas Trade (H.M. Stationery Office, 1s. 3d. net). Despite the fact that traffic has trebled in the last few years the service is conducted with a smoothness which would do credit to a much older and more experienced administration. The lines operated by the State Railways administration are:—

Acquired by conventions and treaties	
Erzerum–Sarakamis	232 km.
Sarakamis–U.S.S.R. frontier ...	123 ,,
Konya–Yenice	346 ,,
Adana–Fevzipasa	142 ,,
Toprakkale–Payas	40 ,,
Fevzipasa–Meydaniekbez	35 ,,
	918 ,,
Newly constructed lines	
Samsun–Kalin (Sivas)	380 km.
Ankara–Kayseri–Sivas	602 ,,
Kutahya–Balikesir	253 ,,
Fevzipasa–Elaziz–Diyarbekir ...	528 ,,
Irmak–Filyos...	390 ,,
Bogaz Kopru–Ulukisla	172 ,,
Afyon–Karakuyu and branch ...	152 ,,
Filyos–Zonguldak	26 ,,
Cetinkaya–Malatya	140 ,,
Sivas–Erzingan	335 ,,
Samsun–Cassamba	37 ,,
	3,015 ,,
Bought from foreign companies	
Anatolian Railway	1,032 km.
Mersina–Adana	67 ,,
Mudanya–Bursa	41 ,,
Izmir–Kasaba	703 ,,
Izmir–Aydin	609 ,,
Oriental Railways	337 ,,
	2,789 ,,
Lines still worked by foreign companies	
Cobanbey–Mardin–Nusaybin ...	407 km.
Ilica–Palamutluk	29 ,,
	436 ,,

Of these railways, 6,283 km. (3,904 miles) are of normal gauge (4 ft. 8½ in.), but the 123 km. (77 miles) of the line to the U.S.S.R. frontier are of 5-ft. gauge, the Mudanya—Bursa line is of 1·05 m. (3 ft. 5¼ in.), and the Erzerum—Sarakamis and Samsun—Cassamba lines are of 0·75 m. (2 ft. 5½ in.) gauge. The total length of the State lines is 6,722 km. (4,177 miles), and that of the private lines 436 km. (271 miles), or 7,158 km. (4,448 miles) in all.

During 1938 the Divrik—Erzingan section, 159 km. in length, of the Sivas—Erzerum line, was opened to traffic. Of the total length of this line—approximately 548 km.—335 have already been constructed and it is expected that the remaining section will be opened to traffic by the end of 1939. The lines from Diyarkebir to the Iran and Iraq frontiers will have a common line as far as Meseriç, a distance of some 163 km. From this point the Iraqi section will be directed to Cizre and Guvara, a distance of 292 km., and the line to the Iran frontier will pass through Bitlis, Van, and Kotur, about 353 km. With the completion of the Divrik—Erzingan section of the Sivas—Erzerum line, the length of new lines constructed since 1924 amounts to 3,015 km. (1,873 miles) of State Railways, besides 20 km. of privately-owned decauville line. A new line between Angora and Istanbul, *via* Bolu, is contemplated. This would shorten the present journey to Istanbul by some four or five hours, as it avoids the long detour through Eskisehir. A total of £T.347 millions will have been expended on the Turkish railways to the end of 1938-39 fiscal year, and of this sum £T.308 millions have been met from the Budget and £T.39 millions carried forward as a charge against future budgets. The revenue of the railways has increased from £T.21,296,000 in 1934-35, to £T.34,107,000 in 1937-38. Passenger receipts alone increased from £T.5,305,000 to £T.9,700,000. Road motor transport is relatively undeveloped in Turkey owing to the lack of good all-weather roads.

TRANSPORT SERVICES AND THE WAR

Activities in the Control of Railways and in Evacuation

Just before we closed for press last week, the announcement was made that the evacuation of children and other priority classes would begin on the next day (Friday, September 1). There was then, of course, no formal state of war in Europe, but the deterioration of German-Polish relationship had reached such a delicate point that the risk of imminent and widespread war overshadowed everything. Early on Friday morning it was announced by the Nazi Government of the Free City of Danzig that the territory desired incorporation in the German Reich, and almost immediately afterwards the German Chancellor accepted such inclusion forthwith. Polish officials were excluded from the railway in Danzig, and all Danzig-Polish rail traffic ceased. Also early on Friday morning, a German air attack was launched against Polish towns.

Control of Railways

On the same day (September 1), the Minister of Transport made an Order taking control of the undertakings or portions of undertakings in Great Britain wholly owned by, leased to, or operated by, any one or more of the following undertakers—

1. Southern Railway Company,
2. Great Western Railway Company,
3. London Midland & Scottish Railway Company.
4. London & North Eastern Railway Company,
5. London Passenger Transport Board,
6. Any joint committee of any two or more of the above,
7. East Kent Light Railway Company,
8. Kent & East Sussex Light Railway Company,
9. King's Lynn Docks & Railway Company,
10. Mersey Railway Company,
11. Shropshire & Montgomeryshire Light Railway Company.

The Minister of Transport announced that he had appointed the Railway Executive Committee, consisting of Sir Ralph Lewis Wedgwood, C.B., C.M.G. (Chairman), Sir James Milne, K.C.V.O., C.S.I., Mr. C. H. Newton, Mr. Frank Pick, Mr. Gilbert Savil Szlumper, C.B.E., and Sir William Valentine Wood, to be his agents for the purpose of giving directions under the Order. Further reference to this official control of railways before the outbreak of war is made in an editorial note on page 337.

It will be observed that the Minister's Order refers to the "undertakings" of the different railway authorities and not only to the railways themselves. The London buses, including the Green Line services, are, of course, an essential part of the undertakings of the London Passenger Transport Board, and as such will be operated, in the same way as the railways generally, under the control of the Railway Executive Committee. Accordingly, the following special notice, "by order of the Railway Executive Committee," was posted in all London buses, and other passenger road vehicles :—

PASSENGER TRAFFIC BY RAILWAY AND ROAD

"The London Passenger Transport Board regret that in consequence of the crisis it is necessary for them to give notice that their regular road and rail services may be considerably curtailed or interrupted, and that they will only be able to book and convey passengers as circumstances permit, and then only on the understanding that they cannot be responsible for any delay or loss which may arise through any such curtailment or interruption."

Evacuation

Evacuation of school children and other priority classes, began on September 1 from all the towns included in the Government's evacuation scheme at that time; other places have since been added. The main-line railways announced that there would be some alterations in their train services during the four days allowed for evacuation, and that London suburban traffic between 8 a.m. and 5.30 p.m. would be limited to a skeleton service. Suburban travellers found that in fact they suffered very little inconvenience, and quite a good main-line service was maintained. Children were entrained at 72 Underground stations, and both the red (Central Area) and green (Country) buses of the London Passenger Transport Board were used so extensively in the operation that ordinary services were curtailed. In Scotland, where corresponding arrangements were made, the work of evacuation began on August 31. Provision was made for moving upwards of three million persons (half of them children), of whom 400,000 were from London alone. The 240 Green Line coaches converted into ambulances were available for the transport of hundreds of patients to hospitals outside London. Later reports show that evacuation all over the country was effected within the period and on the lines originally planned, with the greatest success and efficiency, not a single important hitch or casualty having been recorded. In fact, the schedule was improved upon in a number of cases, in view of the increasingly tense situation. The evacuation was a triumph of successful organisation on the part of the transport undertakings and all concerned, who were specially thanked in a broadcast by the Minister of Transport.

Tube Stations Closed

London Transport announced on September 1 that 19 Underground stations would be closed until further notice, in order that certain works might be effected. At some of the stations, it was explained, subways for interchange between lines would be kept open. The stations closed are as follow :—

Arsenal, Balham, Bank (Central Line, interchange maintained), Bond Street, Chancery Lane, Charing Cross (Bakerloo and Northern Lines), Clapham Common, Green Park, Hyde Park Corner, King's Cross (Piccadilly and Northern Lines), Knightsbridge, Maida Vale, Marble Arch, Old Street, Oval, Oxford Circus (interchange maintained), Tottenham Court Road (interchange maintained), Trinity Road, Waterloo (Northern Line).

Leicester Square station, which it was originally intended to close, was included on some printed lists, but in fact remains open. As we announced last week, on the Northern Line there will be no trains until further notice between Kennington and the Strand. Holders of season tickets to closed stations may retain them and complete their journeys from the nearest open station by bus, tram, or trolleybus, but, owing to the exceptional circumstances, accommodation on the alternative routes cannot be ensured. If they wish, holders may surrender their season tickets at any ticket office, or send them by post to the Commercial Manager, London Transport, 55, Broadway, S.W.1; they will, in due course, receive a full refund for the unused period from the date of surrender. No tickets will be issued to closed stations, but only to the nearest open station. Ordinary single, return, and workmen's tickets will not be accepted on the alternative road services. Cloakroom deposits were removed from the closed stations to the lost property office at 200, Baker Street.

Outbreak of War

On Saturday, September 2, the whole country was awaiting news of final notes addressed by the British and French Governments to the German Government demanding the immediate suspension of all military activity against Poland as a prelude to negotiation to settle outstanding matters between Germany and Poland. In view of British treaty commitments to Poland, to aid her against aggression, a British ultimatum with a time limit was delivered to Germany on Sunday morning, September 3, and the Prime Minister announced in a broadcast address to the nation at 11.15 that morning that a state of war existed between this country and Germany. At 11.15 a.m., also, Mr. R. Dunbar, Head of the Treaty Department of the Foreign Office, went to the German Embassy, where he was received by Dr. Kordt, the Chargé d'Affaires. Mr. Dunbar handed Dr. Kordt a notification that a state of war existed between Great Britain and Germany as from 11 o'clock B.S.T. that morning. This notification constituted the formal declaration of war. At 11.20, twenty minutes after the expiry of the time limit laid down in the British ultimatum to Germany, Herr Von Ribbentrop invited

Sir Nevile Henderson to call upon him and gave to him the German reply. This proved to be a document of some eleven pages, the main point of which was a refusal by the German Government to give any assurance about the withdrawal of troops. The remainder of the reply consisted of propaganda of which the sole purpose seems to be an attempt to lay the blame for the present war on the shoulders of Great Britain.

In accordance with customary diplomatic usage, full facilities were extended to Dr. Kordt, the German Chargé d'Affaires in London, to enable him and the staff of the German Embassy to leave the country. Facilities were extended equally to German Consular officers to enable them to leave England. An assurance was received from Dr. Kordt that full facilities were similarly being extended by the German Government to Sir Nevile Henderson and the staff of the British Embassy in Berlin, and to British Consular officers in Germany. Dr. Kordt and the staff of the German Embassy left Gravesend by the ss. *Batavia* of the Batavier Line for Rotterdam at 11.35 p.m. on September 4. The sailing was delayed from the normal time because of news that Sir Nevile Henderson, British Ambassador in Berlin, and his staff had been detained by the German authorities at the German-Dutch frontier. The Netherlands Government, however, offered to act as go-between to synchronise the exchange of the Embassies, an offer which was accepted by the British Government. The United States Government has acceded to the request of His Majesty's Government in the United Kingdom to take charge of British interests in Germany, which have accordingly been entrusted to the United States Embassy in Berlin. The charge of German interests in Great Britain has been taken over by the Swiss Legation in London.

Privately-owned Wagons

In order to meet the heavy demands for railway wagons during the present emergency, the Minister of Transport has requisitioned all privately-owned railway wagons other than those classes of railway wagons enumerated below and has vested the Railway Executive Committee with power to use or deal with the wagons so requisitioned. In the absence of any directions to the contrary by the Railway Executive Committee, the requisitioned wagons already upon or hereafter brought upon the system of any railway company whose undertaking is controlled by the Minister, will be used interchangeably with railway-owned wagons in accordance with the directions of the Railway Executive Committee. Wagons standing upon private sidings must be surrendered on demand by any such railway company, and such access to the private siding as may be necessary for their removal shall be given to the railway company, but until such demand is made they may be loaded and despatched as usual. Wagon hire will hereafter be charged for the use of all requisitioned wagons for traffics the existing conveyance rate for which does not include wagon hire. The classes of railway wagons exempted from this requisition are :—

1. Tank wagons.
2. Wagons specially set apart from specific traffics such as : cement, copperas, lime (roofed wagons only), night soil and sewage, nitre cake, salt, and tarred materials.
3. Wagons not suitable for running on main lines.
4. Registered wagons reserved for internal use at collieries and works.
5. Specially-constructed wagons.
6. Wagons usually used for working over private railways only.
7. Wagons restricted to working over a particular portion of a railway company's line.

British Merchant Ships

The Admiralty has issued the following announcement for all British merchant vessels. All ships are liable to examination by the British Naval Contraband Control Service. British ships coming under any of the following categories will not normally be detained on interception longer than is necessary to establish their identity :—

(*a*) Ships on Government charter ;
(*b*) Ships bound direct for British or allied ports and which will discharge all their cargo and passengers in such ports ;
(*c*) Ships whose last port of call was British or allied and which have a special war clearance therefrom.

Other British ships may on interception on certain routes be required to put into a Contraband Control base for more detailed examination.

The Admiralty, profiting by past experience, has already taken certain measures which were developed only slowly during the last war. Among these is the reintroduction of the convoy system for merchant shipping to assist the merchant navy in its vital duty of ensuring the overseas traffic of the British Commonwealth and its allies.

Movement of Goods through Ports

At each of the principal commercial ports in Great Britain, the Minister of Transport has appointed a Port Emergency Committee, which will act as his representative to secure the efficient operation of the port. Each committee has been given wide powers for this purpose by the Control of Traffic at Ports Order, 1939, made under the Defence Regulations and in particular will have power if circumstances justify to prevent any undue congestion of traffic by the imposition of penalty rents, and by the physical removal of goods to alternative places of storage. Each committee is generally composed of representatives of the port authority, of shippers, of traders, of labour, and of the forms of transport serving the port. The Minister of Transport appeals to traders to take all possible steps to secure the rapid passage of their goods through the ports.

As regards imports, the owner or consignee should maintain close touch with the shipowner to ascertain at which port the vessel may be expected ; this may differ from the port to which the vessel was originally destined. The owner or consignee should have the documents relating to his consignment at the port of discharge and should be prepared, either personally or through his agent or representative, to clear them quickly through the port to their destination inland and to use for this purpose whatever means of transport may, at the time, be available and convenient. If an agent is employed, he should be given a reasonable discretion to deal with the goods as circumstances may require.

As regards goods for export, the exporter or his agent should maintain close touch with the shipowner and, in general, should not forward the goods to a port until he is satisfied that the vessel will be available.

Home Rail Services

On the L.N.E.R., the Coronation, Silver Jubilee, West Riding Limited, and East Anglian high-speed trains have been cancelled until further notice. Practically all excursion bookings are cancelled, although for the present cheap day tickets will be continued. The L.M.S.R. has cancelled all excursion trains in England and Wales, and the running of the high-speed Coronation Scot. Other main-line services are being continued for the present.

Cross-Channel Services

As regards the L.N.E.R. North Sea services, sailings from Harwich to the Hook of Holland and Harwich to Antwerp have been cancelled, but the Harwich-Flushing and Harwich-Esbjerg services will continue to operate for the present. The Southern Railway Company announces that the port of Dover being closed, services to that point for the Continent are discontinued. The following services continue to run to the Continent : from Victoria, *via* Folkestone and Boulogne ; *via* Folkestone and Calais ; *via* Newhaven and Dieppe ; and from Waterloo, *via* Southampton and Havre. The Channel Islands services will be run three times a week.

Continental Services

The French Prime Minister, by a decree published in the *Journal Officiel* of August 30, ordered the military authorities to requisition the railways. Commercial transport may be suspended completely or partially until further notice, according to military requirements. It was recommended that persons able to leave Paris should do so while transport was available, as it was not known to what extent the railways might have to be reserved for military requirements. Large numbers of Paris school children have been evacuated to the country, and arrangements made to evacuate patients from Paris hospitals.

All Polish railways were of course requisitioned for troop transport by August 28, and there were no trains of any sort between Dantzig and Poland. The Italian Minister in Berne has given an assurance to the Chief of the Political Department of the Federal Council that Italian railways and ports will

remain free for merchandise bound for Switzerland. Meanwhile, it was announced that owing to the suppression of the corresponding German trains, through passenger trains from Italy to Germany were suspended. International expresses bound for Germany through Switzerland are stopping at Basle. In Italy, the gradual imposition of restrictions on railways, motoring and flying, means that public transport facilities will be reduced by about 50 per cent. Trains run on fuel-oil will be suppressed (main-line railways in Italy are now largely electrified) and all pleasure excursions will be suspended. The frontier between France and Italy, temporarily closed, has been re-opened.

It is reported that as a result of the bombing by German forces of trains running between Lithuanian and Polish territory, services between the two countries on the Kaunas-Vilna line have been suspended.

Air Lines

The Postmaster-General announced on September 5 that the air mail services *via* France to North and West Africa, South America, and French Indo-China are temporarily suspended.

All civil flying in the countries at war has now been suspended.

The Tank Method of Retarded Rail Cooling

A description of some further researches in the problem of shatter-cracking in rails, and of the American method of conducting retarded cooling in tanks

The problem of the transverse fissure in rails is one which continues to occupy the close attention of American railways. So far from there being any decrease in the number of fissured rails which either break in service or are detected and removed before failure takes place, the total tends steadily to increase. In all the circumstances, this is not perhaps surprising. Several factors combined to produce the shattering tendencies in the steel of the rail-heads of American rails. Chief among them were the increase in combined carbon and manganese percentages, the increased cross-sectional area of the rail sections rolled (and of the head in particular), the high temperatures of present-day rolling and finishing, and the extremes of atmospheric temperature in North America, especially the cold winter temperatures, which, by reason of the outdoor cooling of rails at most American mills, caused unduly rapid cooling of the exterior surfaces of the rails.

But fully fifteen years elapsed between the first discovery of rail fissuring in America and the finding of any remedy. During that period millions of tons of rails of the heavier sections were rolled to the new analysis limits. In all of these, as subsequent discoveries have proved, shattering of the heads—minute discontinuities of the metal which have been caused by internal stresses in cooling too great to be resisted—has been rife. In thousands of these rails service stresses have caused annular growth of shatter-cracks until either fracture of the rail has occurred, or the fissure has become large enough to be capable of detection by the Sperry apparatus. But in many other fissured rails, while the danger is present, the growth is more gradual, and further fissures from the rails rolled during this period, before a remedy was discovered, are constantly revealing themselves. Doubtless in the course of time the danger of breakage of the fissured rails in the track will be almost eliminated; but the business of detection of growing fissures will probably have to go on until all the rails of these suspect years and earlier have worn out and been removed—a process that will probably continue for many years and must ultimately prove extremely costly.

Some further interesting researches into the subject have recently been carried out by the Dominion Steel & Coal Corporation, of Sydney, Nova Scotia, a Canadian firm which produces rails on an extensive scale. These researches were carried out on 85 lb. flat-bottomed rails containing from 0·62 to 0·77 per cent. carbon and 0·60 to 0·90 per cent. manganese, and 130 lb. rails containing 0·68 to 0·83 per cent. carbon and 0·70 to 1·00 per cent. manganese; both qualities contained 0·10 to 0·20 per cent. silicon and not exceeding 0·05 per cent. sulphur and 0·04 per cent. phosphorus. These compositions were in accordance with current American standards for basic open-hearth rail steel, and the extreme divergence from present British practice will be seen in the fact that the British standard medium manganese open-hearth basic rail contains only 0·50 to 0·60 per cent. carbon in conjunction with 0·90 to 1·20 per cent. manganese. It is the fact that the American or Canadian rail may thus contain up to 0·17 to 0·23 per cent. more carbon than the British, even allowing for the higher British manganese percentage, that chiefly explains the greatly increased susceptibility of the former to shattering. The Canadian research showed definitely that the 130 lb. section was more prone to shatter than the 85 lb. section—a fact largely accounted for by the greater cross-sectional area of the head and the higher carbon content—and that while some casts were shatter-free, others showed shatter-cracks in every piece examined, while many casts yielded both shattered and shatter-free samples. An examination of 80 lb. rails containing only from 0·55 to 0·68 per cent. carbon and a maximum of 0·80 per cent. manganese showed no shattering at all.

Middle Rail Susceptibility

The foregoing is already common knowledge, but some novel facts were discovered in relating susceptibility to shatter to the part of the ingot from which each rail examined had been rolled. Out of 141 pieces examined, representing 47 casts, only six casts were entirely shatter-free on microscopical examination; in twenty-one casts all three specimens showed shatter in the heads. A total of 43 pieces out of 141 revealed no shatter, while it was present to a slight degree in 41 pieces, and to a serious extent in 57 pieces; eight casts showed all three specimens seriously shattered. In each cast, top, middle, and bottom rails from the ingot were etched in the course of this investigation, and a remarkable outcome was that the greatest susceptibility was found to lie in the middle of the ingot; of the top rail specimens 17 per cent. showed slight shatter and 15 per cent. bad shatter, and of the bottom rail specimens 34 per cent. and 9 per cent. respectively, whereas of the middle rails, although only 17 per cent. showed slight shatter, 36 per cent. showed badly shattered heads. Confirmatory evidence was obtained in an examination of 100 lb. rails; taking both longitudinal and transverse shatter, 23 per cent. of the top rail samples and 22 per cent. of the middle rail samples showed slight shatter, whereas bad shatter was shown by 19 per cent. of the middle rails, compared with only 1 per cent. of the top rails.

An even more striking confirmation was obtained from an American railway which keeps very careful rail records, and has summarised the position in the ingot (A, B, C, D, E, and

Method of discovery	A (top) rails	B rails	C rails	D rails	E rails	F (bottom) rails
Broken in track	17	38	59	70	50	5
Detected by Sperry car ...	24	50	64	87	97	17
Total	41	88	123	157	147	22

F from the top to the bottom; six 39 ft. rails are normally cut from an ingot from which have come all of its rails that have either failed in consequence of fissuring, or have been removed from the track after fissuring had been revealed by Sperry detection. Over a certain period, the rails found defective by fissuring were made up as given in the table on page 360.

Possible Causes of Shatter

Apart from this curious phenomenon of the greater susceptibility of the middle of the ingot, experiments were made to determine what effect, if any, other conditions of steelmaking, rolling, and finishing might have on the shatter problem. The Dominion Steel & Coal Corporation had had considerable experience in the production of specially clean steel for axle and shaft forgings, using silico-spiegel as a cleanser and a deoxidiser. A cast of such steel was made and rolled into 100 lb. rails, but samples from the top, middle, and bottom of three different ingots all showed shatter, some seriously. As regards rolling mill practice, it is realised that soaking, rolling, and finishing temperatures—also wash-heating temperatures, in mills in which reheating takes place between the cogging and the roughing and finishing rolls—all may have some effect on the development of shatter; unduly high temperatures in particular are likely to produce a coarse grain in the steel which might be expected to shatter more readily. But there is no decisive evidence on this point. A further experiment was made in order to see whether excessive straightening of rails badly bent or cambered during rolling would produce fissuring; two 100 lb. rails, 39 ft. long, cambered 6⅜ in. and 5¾ in. respectively, were therefore selected, but thirteen samples taken from these rails, and some from positions in which the most severe gagging had taken place, showed no sign of shattering. Further experiments of various kinds confirmed the conclusions which had already been reached in the researches of Messrs. Sandberg in this country, that although certain factors might increase susceptibility to shattering, the actual stresses producing this undesirable condition of the rail-head were developed during the final cooling out of the rail, and that the retarding and evening-out of the cooling throughout the section of the rail provided a certain preventive of shatter development.

Retarded Cooling in Tanks

The method of retarded cooling adopted at this and various other North American steelworks, however, dictated by works layout and production conditions, differs from the Sandberg oven as used in this country, and takes considerably longer time. It consists of loading the hot rails into what is called a "tank," in which they are left until they have practically cooled out. The tank is a steel frame, with sides of corrugated steel sheets, and sheet steel ends and cover. Brick linings to reduce radiation were found unnecessary. A typical tank at the Dominion Steel & Coal Corporation's works, to hold 39-ft. rails (the standard length), is 41 ft. long, 5 ft. 6 in. wide, and 8 ft. 6 in. high. The height is limited by crane clearances, but a tank of this size holds about 150 rails of the 100 lb. or 120 rails of the 130 lb. section, stacked in tiers. With seven of these tanks it is possible to accommodate 1,100 tons of rails, or 100 per cent. of the production of an entire shift. The space occupied by the tanks, which are arranged about 2 ft. apart, takes up a comparatively limited area of the rail hot-bank, and no congestion has arisen in consequence. By the time the first 25 to 30 rails from a rolling have appeared on the hot-bank, the leading rails have lost all visible redness, and charging begins. The rails are turned head up, and inserted by magnet cranes in tiers of ten at a time, separated by skid bars. The cover of the tank is then put on with the same magnet.

During the filling of the tank a thermo-couple, 8 ft. in length, is inserted through one of the end walls, in such a way that it is not actually in contact with any rail. It is usually about half-an-hour after the insertion of the latter before the peak temperature is reached inside the tank; this usually runs about 370° C., but recorded maxima have been as high as 440° C., and as low as 310° C.; no trace of shatter was found in rails from the last-mentioned cast that had cooled in the tank, though air-cooled rails from the same cast had very perceptible shatter in the heads. From this peak temperature, due in part to lag in the thermo-couple and in part to equalisation of temperature between the inside and outside of the rails, cooling in the first few hours is at the rate of about 25 to 30° C. per hour, but gradually slows down until finally it is not more than 5° C. per hour; the rails are withdrawn when the temperature of the tank has dropped to about 50° C. above atmospheric temperature, and the entire cooling operation takes from 24 to 30 hr. The range of cooling may err on the safe side, but the efficiency of the cooling process as a safeguard is proved by the fact that out of 350 samples from rails which have been passed through the tanks, not one on etching has shown a trace of shatter, whether the sample has been taken from a rail which has occupied a middle, an outside, or a top position in the tank; neither has there been any perceptible annealing or softening of the steel. These results have been confirmed by the physical tests laid down in the American rail specification, including in particular falling-weight tests conducted on the rails head downwards instead of head upwards; putting the head thus into tension as the rail is subjected to severe shock may be relied on to break any rail in which any measurable shattering of the head has taken place in cooling. This foot-up testing has been similarly standard in this country for some years past with rails that have received the Sandberg sorbitic treatment, though not with ordinary rails, for with the carbon and manganese range standard in Great Britain the chances of shatter-cracking in ordinary rails is remote. But, as is well known, the method of retarded cooling is now in almost universal use in the production of rails for British railways, because of the improvement in the physical properties of the steel that it has been proved to effect.

Djibouti to Addis Ababa Traffic

Since the Italian occupation of Abyssinia, the Franco-Ethiopian railway authorities have continued to improve the transport facilities offered by the line from the port of Djibouti, in French Somaliland, to Addis Ababa, the Abyssinian capital. The equipment of the port has been greatly improved and the wharves extended. At the request of the Italian authorities the railway has been equipped to transport 1,000 tons daily in each direction, instead of the previous 250 tons. The rolling-stock has been increased by 37 locomotives, 155 wagons, 5 passenger coaches, 4 rail-cars, and 6 Garratt locomotives. Three sleeping-cars have been ordered and are under construction in Italy.

Other improvements include the enlargement of workshops, extension of sidings, and building of workmen's dwellings. The company has financed this work out of its own resources as the uncertainty of the international situation virtually excluded financing by loans. The railway rates and fares have been reduced, despite the fact that the export trade has disappeared since the Italian occupation, and wages have greatly increased. The fares since July 1 have been reduced by 20 to 60 per cent., so that the cost of transport from Djibouti to Addis Ababa, calculated in gold francs, is now scarcely more than a third of the fare 20 years ago.

The line traverses difficult country, rising by more than 7,000 ft. on the Abyssinian plateau, and this adds greatly to transport costs. But the company is able to transport salt, cereals, and building materials from Djibouti to Addis Ababa, 487 miles, at rates varying from fr. 400 to fr. 600 a ton. The same transport by road from the Italian port of Massaouah to Addis Ababa costs about 1,300 lire, or fr. 2,600. During recent months railway transport to the interior of Abyssinia has shown a tendency to expand, despite road lorry competition from the Italian ports, and any easing of the political tension between France and Italy would still further favour the growth of railway traffic.

XUM

NOTES AND NEWS

British Rail Traffic Returns.—The Railway Executive Committee announces that the weekly traffic returns of the main-line railways and the London Passenger Transport Board have been discontinued for the time being.

Irish Railway Fire.—On August 27, the Ballyshannon storage premises of the County Donegal Railways were gutted by fire, and one of the railcars was badly damaged.

Electric Locomotive Construction.—The mechanical portions of 70 electric locomotives intended for service on the Manchester Sheffield section, now being electrified, are under construction at the L.N.E.R. Doncaster works.

A.R.P. Electric Lamps.—Special types of Osram, Osglim and Osira electric lamps complying with the emergency regulations are described and priced in a brochure just received from the General Electric Co. Ltd., of Magnet House, Kingsway, London, W.C.2.

Steam Train Acceleration.—Tests made in France with a Pacific locomotive showed that it could accelerate a 394-ton trailing load of passenger coaches on the level from rest to 19 m.p.h. in 60½ sec., to 36 m.p.h. in 119 sec., to 56 m.p.h. in 209 sec., and to 67 m.p.h. in 300 sec.

Dudley Zoo Locomotive.—A third locomotive has been delivered by Twining Models Limited, of Northampton, for the Dudley zoo. It is a close copy of a Great Western Railway 4-6-0 "Saint" locomotive, except that outside Walschaerts gear is used. The gauge is 10½ in., and trains carrying up to 48 passengers are hauled.

New Cylinders for 4-6-0 "Lord Nelsons."—New cylinder designs with improved steam and exhaust passages have been prepared for the four-cylinder 4-6-0 "Lord Nelson" engines of the Southern Railway, and cylinders of the new type are to be fitted as the engines come in for cylinder repairs. Locomotives Nos. 851, 857 and 860 are already equipped. The piston valves are 10 in. in diameter.

Steam Train Costs.—According to recent figures the cost of operating a French five-car steam train with 290 seats and hauled by a 4-6-2 locomotive is 22.45 fr. per km., inclusive of interest but not depreciation charges. Of this total, the wages of the driver and fireman account for 1.00 fr., the wages of the train staff for the same amount, maintenance for 9.00 fr., fuel for 3.10 fr., and depreciation plus renewal charges for 7.70 fr. The purchase price of the complete equipment is reckoned at 6,250,000 fr., at present values. On the Italian State Railways, one of the Gruppo 691 Pacifics and a seven-car train with 456 seats cost 7.98 lire per km. to operate, of which fuel accounts for 2.33 lire, maintenance for 3.77 lire, depreciation plus renewal for 0.75 lire, and engine-crew wages for 0.54 lire.

Tecalemit Sports.—The annual sports day of Tecalemit Limited was held on September 2 at the Polytechnic stadium, Chiswick, under the presidency of Mr. R. A. Chalmers, Managing Director of the company.

Permanent Way Awards.—Under the scheme authorised by the directors of the Great Western Railway, awards have just been made in each engineering division to the permanent way gang which maintained the highest standard of efficiency during the past 12 months.

Aerial Railway Surveys.—For the rapid production of accurate track plans showing the positions of main lines, sidings, and cross-overs on the Manchester-Sheffield section of the L.N.E.R., Aerofilms Limited conducted an aerial survey on behalf of British Insulated Cables Limited, which firm has the contract for the overhead equipment for this electrification scheme.

Indian Collision Sequel.—The driver, the guard, and two firemen of the down Dacca mail that crashed into a stationary passenger train at Majdia station on the Eastern Bengal Railway on April 17 last are being prosecuted in the magistrate's court at Chuadanga for offences under the Indian Railway Act and the Indian Penal Code. Charges have been framed against the accused after a preliminary hearing.

Welded Rails in Belgium.—Rail welding on the Belgian National Railways began in 1931, when welded lengths of 36 m. and 54 m. (118 ft. and 177 ft.) were introduced in Braine-le-Comte tunnel. Lengths of 36, 54, and 108 m. (118, 177, and 353 ft.) are now in service in the principal tunnels between Liége and Herbesthal, and in the Cinquantenaire tunnel at Brussels. These lengths are made up of 18 m. and 27 m. (59 ft. and 88½ ft.) standard rails weighing 50 kg. per metre (101 lb. a yd.).

Rail Defect Detection in Russia.—The Transsviaz works at Kharkov has recently perfected a rail Defectoscope on the Karpov system for *in situ* detection of defects in rails. The principle employed is doubtless that of magnetic induction, as with the Sperry detector cars used in North America, but the apparatus used is of such limited size that it can be fitted to the frame of a rail tricycle, similar to the small cars manufactured by the Sumitomo Steel Works of Osaka, Japan, and used on the Japanese Government Railways. Transverse fissures and other internal rail defects are automatically registered on a ribbon, and light signals indicate to an inspector riding on the tricycle the location of each defect, so that the rail may be marked accordingly. The present intention is to build 4,000 of these Karpov Defectoscopes, and to have them in service by the end of the year as part of the equipment of all inspectors in charge of lengths of line in Russia. Editorial comment on the transverse fissure problems appears on page 338.

The Properties and Testing of Heat-Insulating Materials.—A general discussion on "The Properties and Testing of Heat-Insulating Materials," organised by the Joint Committee on Materials and their Testing, in conjunction with the Institution of Gas Engineers, will be held in London on November 23 next. The subdivisions of the subject and the names of the authors who are contributing papers are as follow:—

High-temperature Insulating Material.—British Refractories Research Association (Great Britain); Dr. J. B. Austin, United States Steel Corporation (United States).

Low-temperature Insulating Material.—Dr. Ezer Griffiths, F.R.S., National Physical Laboratory (Great Britain); a paper from an authority in the United States.

Insulation of Buildings.—A. F. Dufton, Building Research Station (Great Britain); Prof. F. B. Rowley, University of Minnesota (United States).

Mechanical Engineering Applications of Insulation.—J. S. F. Gard, Washington Chemical Company (Great Britain); Cope and Kinney, Detroit Edison Company (United States).

In addition, Prof. M. P. Brémond, of the Manufacture Nationale de Sèvres, France, will review the position of heat-insulating materials on the Continent, and Prof. E. A. Allcut, of the University of Toronto, will deal with the subject from the Canadian point of view.

Model Engineer Exhibition.—This exhibition, which was to have been held at the Royal Horticultural Hall, Westminster, from tomorrow (September 9) to September 16 has been deferred until January 4-13, 1940.

Forthcoming Events*

Sept. 22 (*Fri.*).—B.B.C. National Station Programme, 9.30 p.m. "The Iron Road to the West."

Sept. 30-Oct. 1.—Stephenson Locomotive Society (London). Visit to Doncaster Works and Running Shed, L.N.E.R.

Oct. 4 (*Wed.*).—Permanent Way Institution (London), at Underground Railways' Dining Club, Pelham Street, S.W.7, 7 p.m. "American Permanent Way," by Mr. L. Rock.

Oct. 7 (*Sat.*).—Permanent Way Institution (Manchester-Liverpool), at Blackpool. Ten-minute Lectures.

Oct. 12 (*Thurs.*).—Diesel Engine Users Association, at Caxton Hall, Caxton Street, London, S.W.1, 5 p.m. Symposium on Running Gear for Diesel Engines.

Oct. 18 (*Wed.*).—Permanent Way Institution (London), at Underground Railways' Dining Club, Pelham Street, S.W.7, 7 p.m. "All-Welded Underbridges on the Railways of London Transport," by Mr. H. Clark.

Oct. 19 (*Thurs.*).—Institute of Fuel, at Inst. of Mechanical Engineers, Storey's Gate, London, S.W.1, 2.30 p.m. Presidential Address by Lt.-Colonel J. H. M. Greenly.

Oct. 25 (*Wed.*).—United Kingdom Railway Officers and Servants Association, at Trocadero Restaurant, Piccadilly Circus, London, W.1. Annual Dinner.

* Subject, of course, to cancellation

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OFFICIAL NOTICES

Crown Agents for the Colonies

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Applications from qualified candidates are invited for the following post:—

SECTION ENGINEER required for the Nigerian Government Railway for two tours each of 12-24 months, with prospect of permanency. Salary £475-£840 a year. Free passages and quarters and liberal leave on full salary. Candidates, age 23-35, should be Corporate Members of the Institution of Civil Engineers or possess an engineering degree recognised as granting exemption from Sections A and B of the A.M.I.C.E. examination, and have had experience in Railway engineering; bridge and reinforced concrete construction. Candidates who are students of the Institution of Civil Engineers and have had the requisite practical experience, are also eligible for consideration.

Apply at once by letter, stating age, whether married or single and full particulars of qualifications and experience and mentioning this paper to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting—M/8833.

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Railway and Other Reports

Barsi Light Railway Co. Ltd.—A final dividend is recommended on the ordinary stock of 1½ per cent., making 3½ per cent. for the year to March 31 (against 4 per cent. for 1937-38).

La Guaira & Caracas Railway Co. Ltd.—A payment of 31s. 10½d. was made on the 5 per cent. debentures on September 1. This is made up of 1¼ per cent. balance of interest due March 1, 1934, plus interest thereon at 5 per cent. per annum. Earlier in August holders agreed to an extension of the moratorium.

Sheepbridge Coal & Iron Co. Ltd.—The directors recommend a final dividend for the year ended June 30, 1939, of 1s. 6d. a share (the same) on each preference and ordinary £1 share fully paid and 7·2d. a share (the same) on each preference share 8s. paid—all free of income-tax, payable on September 30. An interim dividend of 5 per cent. (the same) was paid in February. Net profits for the year amounted to £239,404, against £245,778 for the preceding year.

Pullman Incorporated.—Earnings of Pullman Incorporated and all subsidiaries from all sources, after deducting all expenses incident to operations and provision for Federal income tax, for the twelve months ended June 30, 1939, amounted to $15,264,652, compared with $17,434,457 for the year 1937-38. Deducting charges and allowances for depreciation $12,509,596, against $11,122,808, leaves a net income of $2,755,056, compared with $6,311,649. Dividends paid in 1938-39 were $4,297,773, against $10,505,833 in 1937-38, and the income deficit is $1,542,717, compared with $4,194,184.

Silverton Tramway Co. Ltd.—The report for the year to June 30, 1939, shows revenue of £173,089, compared with £174,645 for 1937-38. Working expenses and taxes take £98,215, against £94,047, and the net profit, after providing for depreciation, &c., is £62,755, compared with £63,482 for the previous year. Adding £8,655 brought in makes a total of £71,410 available. Out of this amount the interim dividend paid on February 2, 1939, takes £25,000, sums amounting to £6,250 are transferred to special reserve for repayment of capital, £808 to reserve accounts, and a provision of £6,000 is made for buildings renewal, leaving a balance of £33,352. The directors have appropriated £25,000 for payment of dividend on August 8, 1939, leaving £8,352 to be carried forward.

Contracts and Tenders

Steel Peech & Tozer Limited has received an order from the Central Argentine Railway for 200 steel locomotive tyres.

G.W.R. Contracts

The Directors of the Great Western Railway Company have authorised the placing of the following contracts:—

R. Pratt Limited, Sutton: Supply of four Fordson Sussex chassis.

Scammell Lorries Limited, Watford: Supply of 12 Scammell 6-ton tractors and 35 Scammell 6-ton trailer chassis.

Standard Telephones & Cables Limited, London, N.11: Provision and installation of 3-channel carrier equipment at Paddington, Swindon, Gloucester, Newport, and Cardiff.

Cleveland Bridge & Engineering Co. Ltd., Darlington: Construction of West Ruislip section of North Acton to West Ruislip electric lines, together with three cable bridges.

Haymills (Contractors) Limited, Hanger Green, W.5: Construction of electric substation at Ruislip.

H. Bolton & Co. Ltd., Birmingham: Reconstruction and lengthening of Foster Street bridge, Stourbridge.

Holborn Construction Co. Ltd., London, E.C.1: Reconstruction and widening of Sunset bridge, near Kington station, Herefordshire.

H. Smith, Newport: Widening of Cardiff Road bridge, Newport (mass concrete substructure, reinforced concrete superstructure).

Francis Morton & Co. Ltd., Liverpool: The supply of steel girders and other steel and ironwork of British manufacture.

T. Smith (Rodley) Limited, Rodley, Leeds: Supply and erection of one 30-cwt. travelling steam crane, Weymouth quay.

At the company's docks—

Overhaul of the following vessels: The Port Talbot Dry Dock Co. Ltd., Port Talbot: S.h.b. *Foremost* 27 and dredger *Don Federico*.

Cowans, Sheldon & Co. Ltd., Carlisle: Supply and erection of two 1½-ton electric capstans at Trinity pier, Plymouth docks.

The Egyptian State Railways are enquiring for about 800 km. of lead and cotton-covered enamelled cable. Tenders are to be in by September 30, and a copy of the specification can be obtained from the Stores Department at Saptieh, Cairo, or from the Chief Inspecting Engineer's Office, 41, Tothill-street, London, S.W.1.

Tenders for 360 metric tons of coloured cotton waste are invited by the Egyptian State Railways, to be in at Cairo by October 14. Particulars can be obtained as given above.

Fifty-First Annual Report on the Statistics of Railways in the United States, for the Year Ended December 31, 1937. Prepared by the Bureau of Statistics, Interstate Commerce Commission. Washington, U.S.A.: Superintendent of Documents, United States Government Printing Office, 1938. 11¾ in. × 9¼ in. × 1 in. 282 pp + 227 pp. Cloth covers. Price $1·50 net.—The delay in the publication of this volume of statistics for the year 1937, which has only now been received, is no doubt quite reasonably explained by the mass of detail which has had to be tabulated and summarised. The result is a very complete and concise statement of the statistics of working of the railways of the U.S.A. As in previous reports, the railways are grouped, for statistical purposes, into three classes, on the basis of operating revenues, Class I containing those lines having annual revenues above $1,000,000, Class II, those above $100,000, and Class III, those with less than $100,000. There is also a geographical classification, in which the railways are grouped into three districts, each district being further subdivided into regions. There were 1,179 line-haul companies, and 245 switching and terminal companies, or a total of 1,424 steam railway companies, represented in the statistics. The line-haul companies owned, at the end of the year, 238,539 miles of road. In the five years 1932-1937, mileage operated (including that operated under trackage rights and in Canada) declined from 260,438 to 251,829. Some selected data are included for other common carriers subject to the Interstate Commerce Act. The direct operation of highway motor vehicles by railway companies remains insignificant. A special section, separately paginated, contains admirably codified abstracts of the reports of operating steam railway companies, and the usual voluminous index suitably rounds off this very complete report.

Railway Share Market

The current week in the City has been an initial period of transition from peace to war conditions, and rapid progress has been made in effecting the various adjustments required by the authorities. Earlier in the week regulations were devised for the settlement of open bargains and for the carrying out of inter-office share transactions. It soon became apparent that investors generally were prepared, if necessary, to take the long view and that no heavy selling was likely to develop, and subsequently the decision to re-open the Stock Exchange was announced. All stock and share dealings are to be for cash, but it is clear that adequate facilities are now available to meet the present requirements of investors for business in stocks and shares. Incidentally a broker before executing any order must fully satisfy himself that it is not on behalf of, or for the benefit of any enemy, either directly or indirectly.

Very little selling of home railway stocks has been reported, and sentiment has benefited from the belief that stockholders will receive equitable treatment in respect of the acquisition of control of the undertakings by the Government. The full terms of the financial arrangements will naturally be awaited with much interest, and the general belief is that they are likely to be on somewhat similar lines to the 1914-18 scheme. The assumption is that it might be decided to take the net revenues of a particular peace-time year, such as 1937, as a "standard" and to distribute dividends on this basis on the junior stocks, namely, L.M.S.R. and Great Western ordinary, Southern deferred, and also L.N.E.R. first preference. Alternatively, according to some views, the average net revenues for the past three or four years might be taken as the "standard." Naturally, during the period of Government control necessitated by the war, the natural development of the railways will be arrested and permanent way and railway stock will no doubt be seriously depreciated, but in due course the companies can expect adequate compensation for this.

Owing to the reactionary conditions which have ruled on the Stock Exchange, home railway stocks, in common with industrial and other securities, have declined in value in recent months, and the junior stocks are probably moderately priced, but no definite opinion can be expressed until the full terms of the arrangements between the Government and the railways are published. At all events, it would appear that during the war period the position of the home railways will be much more clearly defined than most other industrial groups, bearing in mind the very wide powers possessed by the Government to mobilise resources as and when required for war purposes. Owing to Government control of the railways, publication of the traffic receipts of the main-line companies and London Transport is being discontinued for the time being.

As a precautionary measure, pending clarification of the position, dealers on Tuesday fixed unofficial minimum prices for home railway prior charges. On the other hand, L.M.S.R. ordinary was slightly better at 12, as was Southern deferred at 11½.

Sentiment in regard to the Argentine railways has been assisted by the belief that their receipts should reflect the increased movement of wheat and other cereals, and the debentures and preference stocks of the leading companies appear to be firmly held.

Wall Street markets have been buoyant on expectations that the production of war materials will provide a big stimulus to industrial activity in the United States. American railway shares reflected the upward movement of values at that centre.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1938-39	Week Ending	Traffic for Week: Total this year	Traffic for Week: Inc. or Dec. compared with 1938	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1938	Prices: Lowest 1938	Prices: Sept. 1, 1939	Yield (see Note)
				£	£		£	£	£					
South & Central America	Antofagasta (Chili) & Bolivia	834	27.8.39	17,500	+ 3,600	34	439,240	528,500	— 89,260	Ord. Stk.	14	7¼	5½	Nil
	Argentine North Eastern	753	26.8.39	12,506	+ 285	9	93,504	97,134	— 3,630	„	6½	2	3½	Nil
	Bolivar	174	Aug. 1939	4,900	+ 1,000	34	34,050	30,150	+ 3,900	6 p.c. Deb.	8	7	7	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	10	4	5½	91/16
	Buenos Ayres & Pacific	2,801	2.9.39	75,310	+ 6,451	10	699,070	678,042	+ 21,028	Ord. Stk.	6½	3¼	3	Nil
	Buenos Ayres Central	196	12.8.39	$140,500	+ $20,500	7	$788,000	$762,800	+ $25,200	Mt. Deb.	15½	8	11	Nil
	Buenos Ayres Gt. Southern	5,082	26.8.39	118,548	— 5,894	9	966,315	1,039,393	— 73,078	Ord. Stk.	17616	8½	6½	Nil
	Buenos Ayres Western	1,930	26.8.39	39,702	+ 3,474	9	340,819	313,584	+ 27,235	„	12¾	5	5½	Nil
	Central Argentine	3,700	26.8.39	122,881	+ 16,336	9	1,084,026	867,985	+ 196,041	„	13¼	5¾	6½	Nil
	Do	—	—	—	—	—	—	—	—	Dfd.	6	2½	2½	Nil
	Cent. Uruguay of M. Video	972	19.8.39	15,153	— 835	8	119,843	124,646	— 4,803	Ord. Stk.	3	1¼	1	Nil
	Costa Rica	188	June 1939	25,240	— 6,129	52	270,756	314,399	— 43,643	Stk.	28	22½	22½	87/8
	Dorada	70	July 1939	14,500	— 4,400	30	95,100	114,600	— 19,500	1 Mt. Db.	105¼	104	102½	57/8
	Entre Rios	810	26.8.39	17,407	+ 707	9	143,610	133,020	+ 10,590	Ord. Stk.	7¼	3½	4½	Nil
	Great Western of Brazil	1,092	19.8.39	4,800	— 200	33	268,000	216,900	+ 48,100	Ord. Sh.	3/-	1/-	1¼	Nil
	International of Cl. Amer.	794	July 1939	$463,615	+ $19,287	30	$3,697,627	$3,454,817	+ $242,810	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	6d.	6d.	1/2	Nil
	La Guaira & Caracas	22¾	Aug. 1939	7,435	+ 2,345	34	49,355	40,670	+ 8,685	Stk.	8	6½	7½	Nil
	Leopoldina	1,918	26.8.39	23,086	— 3,463	34	672,620	666,493	+ 6,127	Ord. Stk.	4	1	1	Nil
	Mexican	483	21.8.39	$283,000	+ $35,500	8	$2,003,100	$1,988,800	+ $14,300	„	1/4	1/16	1/8	Nil
	Midland of Uruguay	19	July 1939	9,153	— 74	4	9,153	9,227	— 74	„	7/8	1/2	1/2	Nil
	Nitrate	386	15.8.39	4,881	— 971	32	75,199	96,357	— 21,158	Ord. Sh.	52/9	19/16	18/8	711/16
	Paraguay Central	274	26.8.39	$2,930,000	— $238,000	9	$28,624,000	$27,536,000	+ $1,088,000	Pr. Li. Stk.	60	5512	40½	1413/16
	Peruvian Corporation	1,059	Aug. 1939	61,433	— 12,254	9	125,839	147,742	— 21,903	Pref.	5¾	1¾	1	Nil
	Salvador	100	26.8.39	¢10,400	+ 444	9	¢85,864	¢104,349	— ¢18,485	Pr. Li. Db.	23	20	19½	Nil
	San Paulo	153½	27.8.39	28,021	— 10,307	34	1,069,884	1,125,977	— 56,093	Ord. Stk.	64	28	21½	95/16
	Taltal	160	July 1939	1,555	— 1,955	5	1,555	3,510	— 1,955	Ord. Sh.	13/16	1/-	1/2	10
	United of Havana	1,353	26.8.39	16,575	— 152	9	129,731	136,054	— 6,323	Ord. Stk.	3/8	1/2	3/4	Nil
	Uruguay Northern	73	July 1939	800	— 108	4	800	908	— 108	Deb. Stk.	2	1	2	Nil
Canada	Canadian National	23,698	21.8.39	714,944	+ 40,866	33	22,744,449	21,357,058	+ 1,387,391	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	— 4 p.c.	Perp. Dbs.	72	60	64½	65/16
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	104	90	89	4½
	Canadian Pacific	17,171	21.8.39	527,200	+ 3,800	33	16,268,000	16,001,600	+ 266,400	Ord. Stk.	8716	41¼	35¼	Nil
India†	Assam Bengal	1,329	10.8.39	38,520	+ 151	19	508,646	490,288	+ 18,358	Ord. Stk.	81½	70	67½	47/16
	Barsi Light	202	20.8.39	2,340	— 90	20	48,292	60,240	— 11,948	Ord. Sh.	60½	54¼	50½	515/16
	Bengal & North Western	2,112	10.8.39	55,225	— 6,287	19	988,870	1,068,735	— 99,865	Ord. Stk.	311	278	250	75/16
	Bengal Dooars & Extension	161	20.8.39	4,270	+ 284	20	45,361	52,445	— 7,084	„	89	83	90½	75/16
	Bengal-Nagpur	3,267	10.8.39	181,650	+ 32,676	19	2,803,058	2,534,988	+ 268,072	„	95½	90	87½	49/16
	Bombay, Baroda & Cl. India	2,986	20.8.39	186,525	+ 4,200	20	3,297,975	3,358,875	— 60,900	„	11216	95	102½	57/8
	Madras & Southern Mahratta	2,967	10.8.39	139,575	+ 8,306	19	2,192,577	2,092,230	+ 100,347	„	108	97	98½	75/16
	Rohilkund & Kumaon	546	10.8.39	10,336	— 2,022	19	197,101	217,481	— 20,380	„	308	285	255	711/16
	South Indian	2,531¾	10.8.39	103 791	— 1,931	19	1,521,412	1,508,229	+ 13,183	„	104	101	94¼	5516
Various	Beira	204	June 1939	83,026	—	40	719 357	—	—	—	—	—	—	—
	Egyptian Delta	623	10.8.39	5.875	+ 486	19	67,548	65,905	+ 1,643	Prf. Sh.	7/8	5/6	1/2	Nil
	Kenya & Uganda	1,625	May 1939	206,557	— 11,295	21	1,220,870	1,309,332	— 88,462	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	49	41	43	8/8
	Midland of W. Australia	277	July 1939	11,258	— 1,985	4	11.258	13.243	— 1,985	Inc. Deb.	93¾	89	89	4½
	Nigerian	1,900	15.7.39	23,621	— 9,602	16	424,516	480,989	— 56,473	—	—	—	—	—
	Rhodesia	2,442¾	June 1939	365,928	—	40	3,246,158	—	—	—	—	—	—	—
	South Africa	13,284	19.8.39	658,940	+ 35,627	21	13,056,722	12,309,656	+ 747 066	—	—	—	—	—
	Victoria	4,774	June 1939	693,446	— 31,680	52	9,360,329	9,809,155	— 448 829	—	—	—	—	—

NOTE. Yields are based on the approximate current prices and are within a fraction of 1/16

† Receipts are calculated @ 1s. 6d. to the rupee

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being over estimated. The statements are based on the current rates of exchange and not on the par value